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INCORPORATING THE
Journal of the Inventors' Institute.

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THE INVENTORS' INSTITUTE,

4, ST. MARTIN'S PLACE, TRAFALGAR SQUARE.

Chairman of the Council—**SIR ANTONIO BRADY.**

THE various efforts which have been made, and the numerous influences now at work to injure, if not to destroy, Patent Rights; the inefficiency of the many well intended, but ill considered, schemes of Patent Law Reform which have from time to time been suggested, and the tendency of which has generally been to prejudice the Inventor, without advantage to the Public; together with the proceedings so essentially involving the interests of inventors which have already taken place in Parliament, show the necessity of an immediate and active co-operation on the part of those interested in Inventions and in Patent Property, and that an Association for the Protection and Defence of Patent Rights is urgently needed. This Institute has, therefore, been established for the purpose of uniting and organizing the influence of Inventors, Patentees and others. Its objects are:—

1st. To protect Inventors' interests and defend the privilege of obtaining her Majesty's Letters Patent.

2nd. To promote improvements in the Patent Laws.

3rd. To facilitate the diffusion of information with reference to Inventions and other subjects beneficial to Inventors and Patentees.

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APPLICATIONS FOR LETTERS PATENT.

*** In this list (Com.) means Invention communicated from abroad.

Further information, as to the progress of these Patents by Notice to Proceed, Sealing, and Specifying, can be obtained at the Office, 21, Cockspur-street, Charing Cross

On May 20th.—1817 to 1835.—R. W. Hailstone. Ships' telegraph and indicator.—E. A. Paillard and Z. Gourlan. Apparatus for opening preserved meat, fish, potted meat, and other tins.—J. Viles. Glove for cleaning and polishing plate and for other similar purposes.—J. Smart. Stocks and dies.—J. Blakey. Machinery for stretching boots and shoes.-E. A. Cowper. Machinery for sewing a sole on to a boot or shoe.—H. Lomax, G. F. Bradbury, T. Chadwick, and T. Singleton. Sewing-machines.—I. A. Vacherot. Propelling and apparatus to be employed therein, which apparatus is also applicable as a ventilator.—L. Sterne. Railway carriages.—F. Crowley. Breach-loading small-arms.—H. Adams. Revolving pistols.—G. Jones. Tobacco pellet for charging smoking pipes.—J. W. Lee. Traction engines and boilers.—S. J. Mackie and C. Faure. Explosive compounds.—W. R. Lake. Wheels for vehicles.—R. G. H. Forbes.—Compound for the manufacture of cements or artificial stone, capable also of being used as an artificial fuel.—G. L. Scott. Blast furnaces, foundry cupolas, and other furnaces for melting or re-melting iron and steel.—H. E. Newton. Hydraulic engines for raising water and for obtaining motive power.—J. J. McComb. Mode or method of uniting or connecting metallic bands or sheets (com).

On May 21st.—1836 to 1849.—T. Fuller. Apparatus for raising and lowering and adjusting venetian and other blinds.—J. Metcalf. Boilers for heating and circulating water.—G. Chapman and G. Denholm. Weighing machines.—E. Rowland and G. E. Rowland. Fire-bars for furnaces.—M. Graig and J. Graig. Churn.—J. Lightowler and C. Barraclough. Looms for weaving.—M. Thompson, W. Thompson, and W. Hodgson. Looms for weaving.—G. P. Wheeler. Artificial fuel.—V. L. Lovibond. Apparatus for consuming smoke, applicable to steam boiler and other furnaces.—E. Tyer. Electric telegraphic apparatus for train signalling on railways.—S. Chatwood. Safes and chambers for storing valuables.—J. T. Tannett, J. Craven and S. Fox. Self-acting machinery for turning, planing, and boring the heavy parts of engineering constructions.—W. G. Simon. Apparatus for obtaining and applying motive-power.—J. Shepherd. Steam boilers or generators.

On May 22nd.—1850 to 1864.—St. J. V. Day. Improvement in the manufacture of railway bars, beams, and similar articles (com.)—A. Wood. Looms for weaving.—J. Imray. Apparatus for supporting respiration and light in suffocating atmospheres and under water (com.)—L. H. Orsat. Apparatus for analyzing gas.—E. T. Hughes. Compressed air motors (com.)—R. Stone. Construction of railways, rolling stock for same, and other apparatus connected therewith.—A. A. R. de Bastos. Mode of advertising.—R. Roberts. Treatment of emery.—G. E. Donisthorpe. Corkscrews.—W. R. Lake. Gas purifying and regulating apparatus (com.)—W. R. Lake. Boots and shoes (com.)—J. Davis. Injectors for feeding steam boilers.—H. H. Murdoch. Steam engines (com.)—H. H. Murdoch. Continuous spinning machines (com.)—F. Wirth. Construction and application of ropes, rods, or chains to be employed for transmitting to the plungers of pumps for driving purposes underground, together with certain improvements in the plungers of the pumps forming connection therewith (com.)

On May 23rd.—1865 to 1875.—J. R. Francis. Treatment of copper pyrites and iron ores to free them wholly or partly from earthy or extraneous matters (com.)—R. A. Smythe. Apparatus for registering the number of passengers carried by tramway and other omnibuses, which invention is also applicable for other similar registering purposes.—Rev. H. Moule and J. W. Girdlestone. Dry closets, commodes, urinals, and other receptacles for putrescible matter.—J. R. Thompson. Instruments to be employed in performing the operations of "sex-marking," "castrating," and "tail docking" of sheep in particular and young calves.—M. Williams. Preparation of varnishes.—H. N. Lee. Combined portable or camp bedsteads, convertible into a couch, chair, and portmanteau.—W. Whitmore. Mounting and driving millstones.—David Jones. Obtaining and applying motive power.—R. A. Rust and J. F. Nicholls. Condensing and preserving milk and the means used in carrying out such improvements, said means or apparatus being capable of being used for boiling in vacuo for other purposes.—J. Higgins and T. S. Whitworth. Machinery for spinning and doubling cotton and other fibrous materials.--W. E. Newton, C.E. Stoves for burning hydrocarbon oils (com.)

On May 24th.—1876 to 1886.—W. Black. Registering apparatus, particularly applicable for tramway carriages and other vehicles.—W. Radeke. Balls or blocks of artificial fuel for heating or burning purposes only.—T. A. Hearson. Speed indicator, or strophometer.—J. Smith. Looms for weaving.—J. Jowett. Reeds or slays used for weaving.—E. T. Gardner Safety magazine lamps.—A. V. Newton. Bale. fastenings (com.)—W. R. Lake. Harvesting machines (com.)—A. M. Clark. Machinery for cutting, preparing, and moulding peat for fuel; also applicable for moulding other plastic materials (com.)—B. Green. Storing and treating sewage.—F. Jenkin. Construction of V pulleys for the transmission of power.

On May 26th.—1887 to 1899.—W. W. Box. Apparatus used in the manufacture of gas.—H. Sisson. Plugs and stoppers.—A.

BRITISH MUSEUM

Sington. Cop tubes used in the textile manufactures (com.)—E. Heyworth. Steam boilers (Complete specification.)—H. H. Henson. Road paving.—A. Browne. Cartridges with special wads, applicable to all classes of fire-arms and ordnance (com.)—J. Watson. Stove for warming offices, halls, churches, and other rooms.—W. H. Spencer. Process of and apparatus for manufacturing illuminating gas.—A. Lutschaunig and J. Ricketts. Appliances for obtaining high temperatures.—C. Johnson. Machinery or apparatus required for traction and other purposes. J. C. W. Jefferys. Scarf rings.—J. H. Johnson. Hulls of ships (com.)—H. Hampson, A. Hellewell, J. Kenyon and W. Chantler. Apparatus or means of heating the brims of hats preparatory to the operation of curling or shaping.

On May 27th.—1900 to 1910.—W. J. Clapp. Machinery and apparatus for cutting coal and for other similar purposes, and in the mode or method of using and working the same.—W. Morgan-Brown. Sewed or seamed hydraulic hose (com.) (Complete Specification).—H. Schallehn. Apparatus for effecting more complete combustion in furnaces, especially locomotive engines (com.)—C. W. Cooke. Apparatus for winding electro-magnets with insulated wires.—A. Barraclough. Apparatus for dewing, damping, and oiling fabrics and fibrous materials.—H. Hahn. Railway and other wheels (com.)—F. Stanfield. Means for preventing fraudulent alterations in bankers' cheques and other like monetary instruments or documents.—W. E. Gedge. Application of jointed or articulated traction apparatus to various agricultural machines, and particularly to mowing and reaping machines (com.)—J. Tatham. Machinery for preparing wool, cotton, and other fibrous materials for spinning.—J. Maude. Chaff cutting machines.—F. Curtis. Cloth wringers (com.)

On May 28th.—1911 to 1930.—J. Tindal. Finishing cloth and machinery or apparatus employed therefor.—A. T. Holland. Cutting of garments and apparatus used therefor (com.)—S. W. Torrey. Rafts, chiefly designed for preserving life at sea.—N. Clayton and J. Shuttleworth. Thrashing machines.—W. C. Flood. Meter for water and other liquids.—J. Schmidt. Tramway rails and wheels.—J. Kidd. Air or vapour gas machines and apparatus connected therewith.—J. Murphy. Wheels and axles.—F. E. B. Beaumont. Rock or stone drilling apparatus.—M. Burke. Boat davits.—W. G. Reeve. Inkstand.—W. R. Lake. Apparatus for generating vapour from bi-sulphate of carbon.—S. Peile. Horse rakes.—F. Curtis. Steam for motive power and valves of engines for receiving such steam (com.) (Complete specification)—W. M. Scott. Machinery for spinning tobacco.—J. Maxfield and Joshua Maxfield. Tea pots and other hollow articles or vessels of metal.—M. Evrard. Apparatus for washing and sorting coal and minerals.—W. L. Wise. Machine for potato sowing (com.)—W. Marrian. Metallic bedsteads and other articles of metallic furniture.—W. R. Lake. Sewing machines (com.)

On May 29th.—1931 to 1950.—C. Thomson. Elastic beds, seats, and other supports or cushions (com.)—H. B. Fox. Locks or expanding fasteners for closing and securing books, albums, folios, dispatch boxes, and various other articles.—R. Werdermann. Process for the production of aluminium.—R. Werdermann. Process for the conversion of chlorides and fluorides of alkaline metals and alkaline earth metals into oxides, hydroxides, and carbonates.—E. Humphries. Straw shakers, to be used in connection with thrashing machines.—C. Hanson. Apparatus for the cutting of coal.—G. S. Robertson. Appliances for relieving life-boats from water.—C. D. Abel. Machinery or apparatus for breaking and scrutching flax, hemp, and such like fibres (com.)—E. D. Risque. Bottles for containing aërated or gaseous liquids, and stoppers for the same.—A. Breeson. Manufacture and preparation of asphalte.—W. Murphy. Apparatus employed in concrete building.—A. V. O'Dwyer. Apparatus for feeding young animals with milk and other fluids.—F. Smith. Apparatus for spinning, doubling, and twisting wool or other fibrous substances.—P. Samain. Breech-loading fire-arms. (Complete specification) J. Imray. Anchors (com.)—J. Imray. Caloric engines (com.)—J. H. Johnson. Apparatus for determining and indicating the rate of speed of machines, carriages, and the surfaces of bodies when in motion (com.) (Complete specification.)—J. M. Stanley. Marine and other boiler fire-places or furnaces.—J. Simpson. Steam engines, part of which is applicable to supplying water to steam boilers.—J. Elce and H. B. Arundel. Machinery for spinning and doubling.

On May 30th.—1951 to 1959.—F. Durham. Indicating or checking apparatus.—A. V. O'Dwyer. Feeding young animals of the milk drinking species.—J. R. Martin. Elastic packing, more particularly applicable to rotatory engines and pumps.—W. B. Woodbury. Photo-mechanical printing, and apparatus and appliances therefor.—C. C. Cramp. Hydraulic carriage washing brush, which may be used for other purposes.—T. J. Smith. Appliances for economizing fuel in stoves, grates, and furnaces (com.)—R. Weare. Dry closet.—F. Dening. Seed and manure drills.—H. Duckham. Hydrostatic weighbridges and platform weighing machines.

On May 31st.—1960 to 1978.—A. Ray. Smoke-consuming furnace capable of being adapted to any purpose (com.)—E. H. Bramley. Easels, writing tablets, tables, and desks on an improved principle.—P. H. Levi. Spring closing joint, applicable to certain articles of jewellery and other purposes.—F. A. Paget. Railway brakes (com.)—D. G. Straight and S. Straight. Keys of pianofortes and other similarly keyed musical instruments.—D. Mills. Boot and shoe soles and apparatus therefor (partly com.)—J. Lamb. Apparatus or arrangements for feeding, heating, and circulating water in steam boilers, and for burning liquid and gaseous fuels in combination with solid fuels in steam boiler and other furnaces, and thereby economizing fuel and preventing smoke.—J. Townsend. Treating sewage or other liquids or substances containing nitrogen, phosphorus, or their compounds, in order to deodorize or precipitate the same, and obtain useful products therefrom.—H. H. Henson. Roadways.—I. L. Pulvermacher. Metal plates, positive and negative, and methods of attaching or connecting plates or elements to form chains or batteries for medico-electric and other purposes; also appliances connected therewith for the application of electric currents.—M. Evans. Apparatus or mechanism for signalling in, operating the brakes, and fastening the carriage doors of railway trains.—J. L. Mills and T. S. Monkhouse. Printing and apparatus for cutting the printed matter at the same time.—D. Tallermann. Meat stands and dishes for facilitating the carving of preserved or potted meats.—J. Wyatt. Apparatus for signalling between the different parts of railway trains, and partly applicable for opening and closing the doors of railway carriages.—W. Taylor and T. Newall. Indicators, and apparatus for preventing the spread of fire in mules for spinning and doubling.—S. Kay and T. Kay. Demulent and nutritive lozenge, a mixture, and an aperient pill.—S. Kay and T. Kay. Stoppers and stoppering bottles.—P. Matthey. Fitting up ships for carrying cattle (com.)—F. Wirth. Ropes and carriages employed upon tramways, and the apparatus connected therewith (com.)

On June 2nd.—1979 to 1982.—R. Swift. Saddles. G. Cockburn. Safety valves.—A. Jack. Thinning turnips and other root crops, and the machinery or apparatus employed therefor.—W. R. Lake. Writing ink and apparatus therefor (com.)

On June 3rd.—1983 to 1995.—B. J. B. Mills. Governors for steam engines and other motors (com.)—E. Whalley. Machines used for winding textile or fibrous yarns or threads on to bobbins or spools.—B. Anderson and J. Harrison. Packing leathers for hydraulic purposes, and the arrangements of machinery or apparatus to be used in their manufacture.—H. P. Scott. Anti-corrosive and protective composition.—W. P. Butchart. Carding jute, hemp, flax, and other fibrous substances, and the machinery or apparatus employed therefor.—W. R. Lake. Collars, and clasps for the same (com.)—J. Heap. Dry closets, commodes, and urinals, and shafts and receptacles for receiving and discharging human excreta mixed with dry, absorbing and deodorizing and disinfecting vegetable or other substances.—J. G. Willans. Castings.—R. Brydon and J. Shepherd. Machinery or apparatus for drilling, boring, or cutting rock or other hard substances.—F. B. Little. Watering pots.—G. Shand. Treating textile materials and fabrics in order to preserve them from mildew and to diminish their affinity for moisture.—T. Hacking. Steam boilers.—A. V. Newton. Compensating spring balance for safety valves (com.)

On June 4th.—1996 to 2001.—J. W. Melling. Safety and relief valves.—E. Milner. Means for facilitating the economy of fuel in steam boiler and other furnaces or fire-places; also applicable in heating apartments or other places.—F. Randell and H. Randell. Double-furrow ploughs.—G. H. Forbes. Cements.—I. Baggs. Gas and gases for illuminating and other purposes, and apparatus to be employed in connection therewith.—T. Blamiers. Saddle-trees.

On June 5th.—2002 to 2015.—J. W. Clinch. Machine for gumming labels and other similar articles.—P. Brotherhood. Engines worked by fluid pressure, such engines being also applicable as pumps for lifting or forcing fluids.—R. Milburn. Apparatus adapted to be employed in the drying and comminution of peat and some other matters.—A. S. McWilliams. Sheep shears, the same consisting in providing a thumb rest and guard upon one blade of the shears, and finger rests upon the shank or back edge of the opposite blade. (Complete specification)—C. W. Siemens. Apparatus for producing and regulating electric currents, such apparatus being particularly applicable for electric lighting (com.)—T. Shelmerdine. Polling stations to meet the requirements of the Ballot.—D. Curror. Implements for cultivation, of steam, water, wind, or animal power.—J. E. Russell. Tucking devices and guides for sewing machines (com.)—H. A. Bonneville. Covering surfaces with wood (com.) (Complete specification.)—W. Willis. Photo-chemical printing.—A. M. Clark. Stone-cutting machinery (com.) (Complete specification.)—H. Handyside. Locomotive engines, and apparatus for accomplishing the safe ascent of steep inclines, and for facilitating the passage of sharp curves.—R. Balfour. Machine for thinning turnips.—A. V. Newton. Electrro-magnetic engines or motors (com.)

On June 6th.—2016 to 2027.—G. T. Livesey. Apparatus used in the manufacture of gas.—J. Kidd. Gas burners (com.)—W. F. Jobbins. Apparatus for washing glasses, dishes, and other similar vessels (com.)—W. Smith and L. J. Smith. Electric time ball apparatus.—P. Frank. Watch-case springs and fasteners for the same (com.)—J. Shanks. Valves and waste preventive apparatus for water-closets, baths, lavatories, and similar apparatus.—W. H. Sterling. Preservation of iron. (Complete specification.)—G. T. Bousfield. Door locks (com.) (Complete specification.)—J. S. Gabriel. Machinery for smoothing stone.—A. Simpson. Cattle food.—J. J. Bodmer. Apparatus for extracting moisture from potters' clay and compounds thereof, cementing compounds, sewage, sludge, brewery residues, and various other substances, and for drying and calcining some of the above-named and other substances.—H. T. Christie. Apparatus for saving life at sea.

On June 7th.—2028 to 2037.—T. Beams. Apparatus for heating the feed-water of locomotive and other engines for boiling liquor in brewers' and dyers' vats, and for other like purposes.—J. Gilbert. Obtaining and applying motive power.—N. Kennedy. Self-acting temple for looms for weaving.—M. Miller. Apparatus for distilling alcoholic spirits.—T. F. Wintour. Ventilators.—C. T. Colebrook. Steam cylinders for steam pumping machinery and steam engines. T. Clunes, W. Holland, and S. T. Dutton. Machinery or apparatus for working and interlocking points and signals on railways.—J. Mitchell. Syphon ventilators.—W. Dargue. Machinery or apparatus to be employed in dyeing wool, silk, cotton, flax, or other fibrous substances in the hank or skein.—G. Horner and A. Dobson. Steam boilers or generators.

On June 9th.—2038 to 2049.—J. B. Leslie. Instrument or apparatus for indicating the direction of ocean and other currents.—D. Halpin and J. B. Alliott. Machinery and appliances for the manufacture of sugar from cane.—E. J. Hahn. Hydraulic blast apparatus.—G. Goldsmith and J. Dilkes. Self-acting gates or sluices and weirs for the prevention of the overflow of water from rivers or watercourses.—M. Hatschek. Mashing and filtering for breweries, and apparatus therefor.—S. Cotton. Machinery for hackling flax and other fibrous materials.—M. H. Gerring. Steam engines.—E. T. Hughes.

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Scientific and Literary Review,

AND RECORD OF PROGRESS IN
ARTS, INDUSTRY, AND MANUFACTURES,
INCORPORATING THE
JOURNAL OF THE INVENTORS' INSTITUTE.

AUGUST 1, 1873.

THE PATENT OFFICE AND ITS SURPLUS FUND.

PERHAPS no man has of late years been more used to point a moral than Mr. Leonard Edmunds, sometime Clerk of the Patents and of the Commissioners of Patents for Inventions, a man to our mind most hardly dealt with. Some few years ago he was continually referred to by certain parties as the great stumbling block to the beneficial development of the Patent Law Amendment Act, and it was naturally expected that as soon as he ceased to hold office all sorts of things would be done at Southampton-buildings for the advantage of inventors. He has now left the scene of his former official life some years, and still we are at a loss to perceive that the good time coming has yet arrived. We are still obliged, on resorting to the Patent Office, to refer to Indexes that require an experienced guide in order to enable us to use them aright,—and those very valuable helps to inquiry into the novelty of inventions, the Books of Abridgments, are so far behind every-day requirements that as systematic aids to research it may be said they are of very small value. After more than twenty years we still have innumerable subjects on which no such books have been issued, and of those already published not a few terminate with information as to patents granted many years ago. Moreover, since Mr. Edmund's time, the very objectionable rule that applicants for patents should themselves supply abridgments of their provisional and complete specifications, filed with applications, has been promulgated,—a rule that tends to produce inferior and unreliable abridgments in the place of superior and reliable ones. Further, nothing has been done to apply the surplus of the Patent Office Fund which annually accrues from patent fees and stamp duties to purposes advantageous to inventors, although this surplus is no more the property of the Government than the interest on the National Debt is their property to use as they please without regard to the just rights of those who have a direct interest therein. We are not quite sure that if everything were done by our Patent Office which it is to the advantage of the inventor and the public that it should do, that the surplus would then be so considerable as it now is. We have often advocated that the Patent Office should be housed in a building, the convenience and even magnificence of which should be equal to the high national importance of the patent system, and the political and industrial greatness of this country, and that there should be a Museum of Models and Specimens technologically arranged in some central portion of the metropolis—not in an out-of-the-way corner at South Kensington—and a library of the most perfect kind, comprising a complete collection of patent lore, technical and industrial literature. And although without a change in the law, and one which is by no means settled upon as desirable, the examination of applications for patents before granting them cannot be carried out,—yet, official directors of searches might be appointed who could assist inventors to inquire into the novelty of their inventions for themselves, and thus avoid the scandal of invalid patents being granted; because, as is now the case, it is less troublesome and expensive to take out a patent at the risk and peril of its entrenching upon one already granted than it is to search the Patent Office for prior patents bearing on the matter of the intended patent. Officials of the kind we allude to would not be simply library attendants, for the Patent Office has already retained the services of most excellent officers of that class; what is required being men of high class as technologists, who should preside over and direct the library attendants, and advise the inventor as to the course to pursue in order to ascertain without excessive labour the status of his invention as to novelty. High officers of this kind would require to be paid salaries nearly as large as that of the chief officer, and must be surrounded by an efficient staff of assistants.

As all this need not entirely absorb the patent fund, we would suggest that in the patent office building provision should be made for experimental and test workshops and laboratories available for all patentees and applicants for patents. Furthermore, that in fitting cases inventors should receive pensions or grants from the surplus fund. Surely those who have been exercising their talents in matters which tend to the advancement of the prosperity of the country are, when in need of it, fit recipients of public bounty, especially when, as in this case, the means of bounty issues out of resources that the recipients have themselves helped to create. Lastly, we suggest that the Inventors' Institute is entitled to share in the division of the spoils. It has now been in existence more than ten years, and has created a bond of union amongst inventors such as many very good judges deemed absolutely impossible at the time that Mr. R. M. Latham, Mr. R. Richardson, Mr. H. Williams, Mr. Campin, Mr. Carttar, and others helped the Institute into existence. Not that it wants State aid to keep it alive, but it would be all the better for having commodious lodgings assigned to it in, or contiguous to, the Patent Office.

There is no desire on our part to ask for anything more than we deem to be strictly just and equitable; but we do hold that if any mulcting of the inventor because he claims remuneration in respect of the results of his ingenuity (for this is the nature of the system of charging him any fees or Government dues whatever on his patent grant) be considered sound policy—which we, however, utterly deny—then we hold that not one penny should be taken from him beyond what is necessary to sustain in efficiency a Public Patent Office, and perhaps to pay the Exchequer such stamp taxes as are usually imposed upon documents which enable a man to obtain the benefit of the judicial power of the country for the protection of his property when needful. If anything should happen to be levied on the inventor beyond this, in such case it ought to be returned to him again in specie, or in valuable advantages, which he may avail himself of if he wishes so to do.

We are not quite sure that this question of Patent Office surplus is properly understood, and we do not think it ever will be unless the history of the Patent Law be referred to. Previously to the Act of 1852 it was necessary that a man should, in order to get a patent, do suit, and pay fees, to no less than three Cabinet Ministers, through whom her Majesty was to be moved to be graciously pleased to grant him a patent. He had also to satisfy the myrmidons of the Chancellor of the Exchequer, who made him pay more than *fifty pounds* for stamp duties alone on each patent granted.

When the Act of 1852 passed all these fees and proceedings were abolished, an entirely new proceedure and fiscal arrangements being substituted; certain Government dues or official fees being required to be paid at or before the grant of the patent, and at the third and seventh years of its duration, these being intended to support the Patent Office, whilst some stamp duties were reserved for the advantage of the *Inland Revenue*,—so that beyond the amount of such Inland Revenue stamp duties and the expenses of the office, the money received was unappropriated by Parliament, being always understood as intended to be used for purposes advantageous to inventors and the public. The result has been that a surplus has been accruing at the rate of somewhere about *sixty thousand pounds* per annum during twenty years past, which we say it is high time should be applied to the benefit of inventors and the promotion of inventive progress, and we feel assured that if inventors will only bestir themselves some such application will soon be made of it.

Reviews.

Sanitary Engineering; A Guide to the Construction of Works of Sewerage and House Drainage, with tables for facilitating the calculation of the engineer. By BALDWIN LATHAM, C.E., M. Inst. C.E., past President of the Society of Engineers, &c. London: E. and F. N. Spon, 48, Charing Cross. New York: 446, Broome-street. 1873.

IN the present day no species of knowledge is of such importance as that relating to the health preserving arrangements which should be adopted in order to render our homes pure and sweet. Now that such large portions of mankind have abandoned the woods and fields, and congregated together in towns which they glory in expanding, thus shutting out nature farther and farther from them, it becomes a life and death necessity to compensate for nature's purifying influences by the application of scientific knowledge in the formation of sewers, drains, and other appliances for overbalancing in favour of life the death-tendency of decay and waste. The sanitary engineer whose business it is to deal with such matters as these exercises—therefore one of the most important of the professions amongst us, yet up to a very recent period it was a profession in which science held a very insignificant position, rule of thumb men and empirics being much more numerous than men of scientific knowledge or intelligent technical training. Happily we are now obtaining a better class of practitioners, and amongst them no one ranks higher than Mr. Baldwin Latham; hence we are not surprised to find that his present work is worthy of all praise, whether considered from a scientific or practical point of view. In the first pages of the work before us Mr. Latham refers to the necessity of sanitary measures, on which we add nothing to the remarks we have already made. He then proceeds to consider various plans proposed in carrying out sanitary works, as to which he remarks that the success of the prosecution of such works is more dependent upon the character of the work, executed than upon any salubrity or insalubrity of climate. This is seen from an examination of the rates of mortality in some continental towns. For example, we find that both Brussels and Paris, which have climates far more salubrious than that of London, have nevertheless a higher rate of mortality than London, proving conclusively, that the sanitary works of London are of a more effectual, and therefore more perfect character, and that they better fulfil their mission than those adopted either in Brussels or Paris.

Various modes have been proposed from time to time for effecting, or perfecting, the appliances within our towns for the removal of all decomposing matter, and various agents have been suggested for use in connection with the removal of those accumulations of filth and dirt which have been found to be so prejudicial to health and life. All the elements known to the ancients have been laid under tribute for this purpose; fire, air, earth, and water have all been proposed and adopted in their turn, as sanitary agents to be used in connection with the removal of such matter, and for securing the great objects sought by the sanitary engineer. The advocates of fire recommend that all the waste products of our towns and populous places should be committed to the flames.

A second set of advocates would have us believe that air is the best agent for removing those matters, and that the pneumatic is the proper system to be adopted.

A third set of advocates recommend mother-earth as by far the best agent that can be used in connection with the removal of all fæcal and decomposing matter from the habitations of the people; whilst a fourth set of advocates maintain that the water-carriage system is the best, and the only feasible plan that can be adopted under the varied requirements of town population.

Upon careful consideration it must be seen that none of those agents which have been proposed fulfil all our requirements, when we have to deal with the question of removing, not only the fæcal matter, but other refuse from the houses and manufactories of our towns. For example, fire, air, and earth are of little use for removing and disposing of liquid filth; whereas water and air are incapable of being applied so as to deal with a very large mass of the accumulating matter of our towns, namely, the sweepings from streets, ashes, and solid garbage from houses, all of which are now required to be removed by manual and horse labour. Air and water have been proposed as the medium by which decomposing matter shall be conveyed through a properly-constructed system of pipes, or tubes, out of our towns, and then used for agricultural purposes. Fire has been recommended simply as a means whereby decomposing matter may be destroyed, or rather converted, by rapid oxidization, into harmless elements. Earth and other materials of this character have from time to time been recommended and used, more with a view to deodorize and fix the elements of decomposition, so as to render the matter to be dealt with less baneful in its effects on health when accumulating in towns, and also as a means of preserving its manurial value.

Of all the systems that have been proposed, the water-carriage system is, in the opinion of the author, the best adapted to the varied requirements of a town population for effecting the speedy removal of the principal matter liable to decomposition. It will also be found equal to any other system in securing the manurial elements that have to be utilized; but it should not be overlooked that other systems are applicable, and may be adopted with manifold advantage when the circumstances are such as to debar the entire use of water-carriage.

The author then deals with the area and plans of the district to be sewered, the consideration of rainfall with reference to sewers; the water supply of a district; self-cleansing sewers by securing a proper velocity in the flow of the sewerage, and on this point he supplies some voluminous practical tables. The course of sewers is fully discussed, and the construction of sewers fully treated, and as an example of the thorough-going practical character of this work we may cite the following:—

In carrying out works of sewerage one of the most important points for the consideration of the engineer is the proper mode of forming the junctions with sewers. In the early sewerage works of this country the ordinary house-drains were usually placed at a level from 18 inches to 2 feet above the invert of the sewer, in order to ensure the drains being kept open or free from the deposit which it was known would surely take place in the imperfectly constructed sewer work of that period; but now that the principle of forming sewers is better understood, and as sewers ought not now to be any longer liable to accumulations of deposit, and as the mode of forming junctions very materially influences the working of a system of sewers, this work should be performed in a proper and scientific manner. It should be laid down as a rule that branch sewers, or drains communicating with sewers, should be made to discharge into the main sewer in the direction of the established current of the sewer, and that the velocity of the discharge of the subsidiary sewers or drains should at least equal that prevailing in the main sewer. Right-angled junctions, both lateral and vertical, have been and are still used for forming the junction with sewers; such junctions, however, have the effect of producing eddies, which check the flow in the sewer, and lead to injurious accumulations of deposit.

The author then illustrates his remarks by reference to diagrams, and adds—

It is customary in practice, when curved junctions are formed, to give the branch sewer or drain a rather greater amount of fall in the curve, in order to make up for the resistance of the bend. Junctions made at points above the flow of the ordinary water-line in the sewer, even when joining the sewer at an angle, act prejudicially in causing eddies by diminishing the velocity. For example, a junction made in the crown of the arch of the sewer, produces the same effect upon the flow as a junction at right angles; because a body of water falling from a height on to a surface of a flowing stream, retards the velocity in the same way as a right-angle junction. The proper position for a junction is within the water-line, but not so low that the flow from it would be checked by the sedimentary deposit that will be rolled along the bed of the sewer. It will be seen that when junctions are so placed that the outfall of a house drain will be below the water-line, the drain will be trapped at its outlet, and therefore the ventilators of house drains cannot judiciously be used to ventilate sewers, and moreover house drains, by reason of the sealing of their outlets, require special means for ventilation. The junctions between brick sewers, and pipe sewers, or house drains, should be formed by the use of a proper junction block.

These blocks may be built into the sewer as the work proceeds, or may be inserted afterwards. Such blocks are made of fire-clay, or of stoneware, and the branch enters the sewer in an oblique direction, and forms the best mode of terminating pipe sewers or drains with brick sewers; otherwise, where pipes are used to form the junction, it is generally necessary to cut them to fit the brickwork at the proper angle, and in cutting pipes the work is not usually so carefully done but that some imperfection remains, which detracts from the merit of the work. The junctions of pipe sewers, or drains with pipe sewers, when curved, are struck from a centre at right angles with the centre line of the pipe, the inside of the straight pipe meeting the inside of the branch at a tangent on a radius line from which it is struck. Where more pipes than one are required for forming a junction, the end of each pipe should, when manufactured, be cut to the radius of the curve with which they are described. The greater the radius of the curve used in forming a junction with a sewer, the less will be the resistance offered to the flow, and the more perfect will be the work. Where sewers are laid in straight lines they may communicate at right angles when they discharge into manholes the outlet from which is placed at a lower level than the inlet. This arrangement requires extra fall to be taken at the manholes, in order to secure the advantages of having the sewers laid in straight lines for facilitating the purpose of examination. The junctions between brick sewers and brick sewers are of nearly similar size. The plan usually adopted is to construct a bell-mouth, which receives the sewer at its largest end, and gradually diminishes at the lower end to the size and shape of the sewer, which will convey the whole volume to be discharged; but where small sewers meet larger sewers they usually join with a curved junction.

The work also contains remarks and directions as to the flushing arrangements of sewers, ventilation of sewers, and many practical details profusely illustrated by engravings.

Light Science for Leisure Hours. Second Series. Familiar Essays on Scientific Subjects, Natural Phenomena, &c., with a Sketch of the Life of MARY SOMERVILLE. By RICHARD A. PROCTOR, B.A., Camb., &c. London: Longman, Green, and Co. 1873.

MR. PROCTOR, in these essays, has fully equalled any of his former productions, and in saying this we wish it to be understood that they possess the highest order of merit, for although the branches of knowledge he treats of are profoundly scientific, yet the manner in which they are dealt with by him is such that any person of moderate education who takes an interest in them will find information presented in a form that will be at once available for his use.

The first pages of this volume Mr. Proctor devotes to a memoir of the late Mrs. Somerville, whose death we recorded in our pages some time ago, and this we shall quote from at some length, as we deem her worthy of the highest public regard, not only as an eminent worker in the cause of science, but as a woman who found her true place in the world without resorting to unseemly clamour for woman's rights, or striving after unwomanly power. She was truly honourable and useful, and well deserves a conspicuous place in the annals of fame.

Mary Somerville (*née* Fairfax) was, it appears, born at Jedburgh on December 26, 1780, and died on November 30, 1872, at Naples, aged nearly ninety-two years. In considering her education, we have not to mention important seminaries, where skilled teachers make it their chief business to impart to others the knowledge for which they are themselves eminent, but to speak only of studies pursued in the calm of a quiet home. This, rightly understood, is perhaps the most remarkable feature of her career. There are few mathematicians so eminent as she deservedly was, in whose fame great public schools and universities do not in some degree partake. But we owe almost to accident the discovery of the powers of Mary Fairfax's mind, while the gradual development of those powers proceeded under the guidance of tutors unknown to fame, and with access only to such assistance as could be given by the friends of her own family.

Mrs. Somerville has herself described how it chanced that the peculiar powers of her mind came first to be recognized. She was in the habit of working at her needle in the window-seat, while her brother took his lessons in geometry and arithmetic. Fortunately (in her case) the work which is regarded as most suitable to the capacity of women leaves the mind unoccupied; and consequently there was nothing to prevent Mary Fairfax from attending to the lessons intended for her brother. She gradually became interested in the subject of these lessons, and took care not only to be present regularly, but to study her brother's books in her own room. It happened that, on one occasion, young Fairfax failed to answer a question addressed to him, and his sister involuntarily prompted him. The tutor was naturally surprised that the quiet Mary Fairfax should have any ideas beyond the needlework which had apparently engaged her attention; but, being a sensible man, he was at the pains to ascertain the degree and soundness of her knowledge, and, finding that she had really grasped the first principles of mathematics, he "took care that she should have liberty to go on in her own way." If a boy had shown similar fitness for mathematical research, anxious attention would have been devoted to the choice of books and teachers, school and university; but the case of a girl showing such tastes seemed to be adequately met by according to her the privilege of following her own devices. We shall never know certainly, though it may be that hereafter we shall be able to guess, what science lost through the all but utter neglect of the unusual powers of Mary Fairfax's mind. We may rejoice that, through an accident, she was permitted to reach the position she actually attained; but there is scarcely a line of her writings which does not, while showing what she was, suggest thoughts of what she might have been.

While studying mathematics "in her own way," she found a difficulty which for a time threatened to interfere with her progress. She was unable to read the "Principia," because she could not understand Latin. In this strait, she applied, "after much hesitation," to Prof. Playfair. She asked if a woman might, without impropriety, learn Latin. After ascertaining the purpose which the young lady had in view—possibly in doubt lest she might follow in the steps of Anne Dacier—Prof. Playfair told he that it would not, in his opinion, do her any harm to learn Latin in order to read the "Principia." It is noteworthy, as having probably a bearing on the course which Mrs. Somerville's reading subsequently took, that Playfair was one of the few in this country who at that time appreciated the methods of the higher mathematical analysis, and had formed a just opinion of their power—"a power, however," as Sir John Herschel well remarks, "which he was content to admire and applaud rather than ready to wield." His excellent review of the "Mécanique Céleste" probably gave (as Herschel suggests) a stronger impulse to the public mind in the direction of the higher analysis than he could have communicated by any researches of his own.

It was not, however, as a mathematician that Mrs. Somerville first became known to the world. A subject of research, exceedingly difficult and only to be pursued successfully under very favourable conditions, was undertaken by her during the life of her first husband, Captain Greig, son of High-Admiral Greig of the Russian Navy. She sought to determine by experiment the magnetizing influence of the violet rays of the solar spectrum. "It is not surprising," says Sir John Herschel on this subject, "that the feeble though unequivocal indications of magnetism which she undoubtedly obtained should have been regarded by many as insufficient to decide the question at issue." Nevertheless it was justly regarded as a noteworthy achievement that, in a climate so unsuitable as ours, any success should have been attained in a research of such extreme difficulty. That she achieved, and, what is more, deserved success, will be inferred from the words in which Sir John Herschel indicates his own opinion of the value of her results: "To us," he says, "their evidence appears entitled to considerable weight; but it is more to our immediate purpose to notice the simple and rational manner in which her experiments were conducted, the absence of needless complication and refinement in their plan, and of unnecessary or costly apparatus in their execution, and the perfect freedom from all pretension or affected embarrassment in their statement."

In 1832 Mrs. Somerville published the work on which, in our opinion, her fame in future years will be held mainly to depend. The "Mechanism of the Heavens" was originally intended to form one of the works published by the Society for the Diffusion of Useful Knowledge, though it soon outgrew the dimensions suited for such a purpose. Indeed, it is remarkable that either Mrs. Somerville herself or Lord Brougham, at whose suggestion the work was undertaken, should suppose it possible to epitomise Laplace's *magnum opus*, or so to popularise it as to bring it within the scope of the Society's publications.

Mr. Proctor enters upon an elaborate criticism of this work, but we shall content ourselves with presenting our readers with the following extracts:—

It is in this sense—regarding the work apart from its special purpose, and judging of it only as a contribution to advanced scientific literature—that we may fairly say, with Sir John Herschel, that the work is one of which any geometer might be proud. There is, indeed, ample evidence of the disadvantage under which Mrs. Somerville laboured, in the want of thorough mathematical training; but so much the more wonderful is it that she should have completely mastered her subject. Every page indicates her appreciation of the methods employed by Laplace and Lagrange. Where she does not strictly follow the "Mécanique Céleste," she evidences a clear recognition of the purposes to be subserved by adopting a different course. I would not be understood as commending all the departures thus made; on the contrary, there are cases where it appears to me that on the whole it would have been preferable to have followed the processes of the "Mécanique Céleste" more closely, while there are others where certain more modern processes might perhaps with advantage have been introduced. But even in such instances we recognize in the course pursued by Mrs. Somerville the decision of one perfectly familiar with the subject in hand. And many of the changes must undoubtedly be regarded either as improvements, or else as altogether desirable when the scale of Mrs. Somerville's treatise is taken into account. Amongst instances of the former kind must be classed the method employed in the investigation of the equations of continuity of a fluid; amongst instances of the latter, I would specially cite the treatment of the theory of elliptic motion, in the opening chapters of the second book.

If, however, I were asked to point out the feature of this work which, in my opinion, most strikingly indicated the powers of Mrs. Somerville's mind, I should unhesitatingly select the preliminary dissertation. In this we have an abstract of the Newtonian philosophy such as none but a master-mind could have produced. Apart from its scientific value—and it has great scientific value—it is a work of great literary merit. If it is not in plan and purpose altogether original, inasmuch as it must be regarded as to some degree an abstract of Laplace's "Sytème du Monde," it is nevertheless, as Herschel has well remarked, "an abstract so vivid and judicious as to have all the merit of originality, and such as could have been produced only by one accustomed to large and general views, as well as perfectly familiar with the particulars of the subject."

Three years after the appearance of the "Mechanism of the Heavens," Mrs. Somerville published the work by which she is probably best known to general readers. The "Connexion of the Physical Sciences" was, I believe, written at the suggestion of Lord Brougham, as an expansion of the admirable introduction to the "Celestial Mechanism." It is a work full of interest, not only to the student of advanced science, but to the general reader. In saying this we indicate its chief merit and its most marked defect. It is impossible to conceive that any reader, no matter how advanced or how limited his knowledge, could fail to find many most instructive pages in this work; but it is equally impossible to conceive that any one reader could find the whole work, or even any considerable portion, instructive or useful. The fact was that Mrs. Somerville recognized, or which is practically the same thing, wrote as if she recognized, no distinction between the recondite and the simple. She makes no more attempt at explanation when speaking of the perturbations of the planets or discussing the most profound problems of molecular physics, than when she is merely running over a series of statements respecting geographical or climatic relations. It would almost seem as though her mind was so constituted that the difficulties which ordinary minds experience in considering complex mathematical problems had no existence for her. A writer, to whom we owe one of the best obituary notices of Mrs. Somerville which hitherto have appeared, tells us that the sort of pressure Mrs. Somerville underwent from her publisher as the earlier editions of the "Connexion of the Physical Sciences" passed through the press "convinced her of her own unfitness for popularizing science. When there was already no time to lose in regard to her proof sheets, she had hint upon hint from Mr. Murray that this and that and the other paragraph required to be made plainer to popular comprehension. She declared that she tried very hard to please Mr. Murray and others who made the same complaint, but that every departure from scientific terms and formulas appeared to her a departure from clearness and simplicity; so that, by the time she had explained and described to the extent required, her statements seemed to her cumbrous and confused. In other words, this was not her proper work."

Respecting her two other works, I shall merely remark that the "Physical Geography" appeared in 1848, and the "Molecular and Microscopic Science" in 1869, when she had reached the advanced age of eighty-eight years.

After some further critiques, Mr. Proctor concludes the memoir thus:—

I have mentioned that Mrs. Somerville was twice married. By her first marriage she had one son, Mr. Woronzow Greig, since deceased. A few years after Captain Greig's death she married her cousin, Dr. Somerville, by which marriage she had three daughters, two of whom survive her. The latter years of her life (twenty-three years, we believe) were passed in Italy. It has been said by one who was well acquainted with the circumstances that "the long exile which occupied the latter portion of her life was a weary trial to her. She carried a thoroughly Scotch heart in her breast; and the true mountaineer's longing for her native country sickened many an hour of many a tedious year. She liked London life, too, and the equal intercourses which students like herself can there enjoy; whereas, in Italy, she was out of place. She seldom met any one with whom she could converse on the subjects which interested her most; and if she studied, it could be for no further end than her own gratification. It was felt by her friends to be a truly pathetic incident that, of all people in the world, Mrs. Somerville should be debarred the sight of the singular comet of 1843; and the circumstance was symbolical of the whole case of her exile. The only Italian observatory which afforded the necessary implements was in a Jesuit establishment, where no woman was allowed to pass the threshold. At the same hour her heart yearned towards her native Scotland, and her intellect hungered for the congenial intercourse of London; and she looked up at the sky with the mortifying knowledge of what was to be seen there but for the impediment which barred her access to the great telescope at hand. With all her gentlenes of temper and her life-long habit of acquiescence, she suffered deeply, while many of her friends were indignant at the sacrifice."

I shall venture to quote, in conclusion, some remarks by Sir Henry Holland on features of Mrs. Somerville's character and life which have been hidden from general knowledge:—"She was a woman not of science only," he tells us, "but of refined and cultivated tastes. Her paintings and musical talents might well have won admiration, even had there been nothing else beyond them. Her classical attainments were considerable, derived probably from that early part of life when the gentle Mary Fairfax—gentle she must ever have been—was enriching her mind by quiet study in her Scotch home. . . . A few words more on the moral part of Mrs. Somerville's character; and here, too, I speak from intimate knowledge. She was the gentlest and kindest of human beings—qualities well attested even by her features and conversation, but expressed still more in all the habits of her domestic and social life. Her modesty and humility were as remarkable as those talents which they concealed from common observation. . . . . Scotland," he justly adds, "is proud of having produced a Crichton. She may be proud, also, in having given birthplace to Mary Somerville."

In the other pages of his work Mr. Proctor treats of the "Coming Transit of Venus, and British Preparations for Observing It," and to this he invites special attention, remarking that the time is drawing near when it will be too late to take action to extend and render complete and satisfactory our preparations for this important phenomenon—the most important, I venture to assert, of all the astronomical phenomena of the present century. Without imputing blame to any person, I must dwell strongly on the fact that the share proposed to be taken by Great Britain in the observations of the transit, is unworthy of her position in the scientific world, and as a nation. There is great risk that, for want of an adequate number of southern stations, the whole series of observations by all countries engaged in the work will result in failure; and it appears to me—nay, more positively—it certainly is a deplorable circumstance, that while Russia and America are providing for more than thirty northern stations, whereof sixteen are Halleyan, Great Britain will supply but three southern stations, of which only one chances to be Halleyan as well as Delislean; while even as respects this one station, Mr. Goschen has told the country, speaking in his place in Parliament, that either Halley's method "will not be applied at all, or at least very little reliance will be placed upon it." Yet at sixteen northern stations, some of them most difficult of occupation, Russia and America will apply this very method; while even the criterion devised to minimize the value of the method, leaves it superior, when applied at the stations I have indicated, to Delisle's, as applied at selected station. Mr. Proctor adds:—I appeal to all who have influence in these matters to examine the evidence for themselves (whether as presented here, or with charts in my Essays in Astronomy, or in recent numbers of the Monthly Notices of the Astronomical Society), and to form their own judgment as to the position of affairs. That is all I ask, since I am satisfied that that will be altogether sufficient to suggest the promptest and most energetic action.

The other essays, all of them worthy of attentive perusal, are the Ever-Widening World of Stars, Movements in the Star-depths, the Great Nebula in Orion, the Sun's True Atmosphere, Something Wrong with the Sun, News from Herschel's Planet, the Two Comets of the Year 1868 (Part I.—Brorsen's Comet; Part II:—Winnecke's Comet), and Comets of Short Period. Followed by interesting observations on the Gulf Stream, Oceanic Circulation, and the Climate of Great Britain; the concluding essay being on the Low Barometer of the Antarctic Temperate Zone.

Six Lectures on Light.—Delivered in America in 1872-1873. By JOHN TYNDALL, LL.D., F.R.S., Professor of Natural Philosophy in the Royal Institution. London: Longmans, Green, and Co. 1873.

THE great number of works bearing on the various experimental sciences recently published would lead to the supposition that the means of scientific and technical instruction (which we still strive for having, and hope to see made available for various classes of the community, though more especially for the working classes) must soon become greatly in excess of the requirements of the case. But this is not so, for these works may be classed under two heads, those that survive only their first issue, which in a majority of cases are works of a very inferior and questionable character, likely to be more injurious than instructive; and those not over-numerous treatises that become reference-books for men of science, and text-books for the guidance of the young student anxious to obtain right and correct ideas of the various phenomena in connection with the different sciences. Amongst this latter class of works those of Professor Tyndall take a high position, for his previous works on the kindred sciences to that of the new work now under notice, namely, "Heat" and "Sound," have since their first issue a few years back, gone through many editions and been translated into the languages of other countries, where they are likewise regarded as standard works. The particular work under notice does not reach that order of merit which we should have expected of him in order to rank with the latest editions of his previous volumes, neither can we say that there is any more contained in it than we have read in other works before. True, Professor Tyndall surpasses most authors of works on science in the lucid descriptive manner of placing facts before his readers; but we could point to one or two recent works on the same subject that to our thinking surpass this work in point of excellence in that respect; but it must be remembered that this work is the substance of lectures given before various audiences, and that, therefore, original research could not reasonably be expected. But there is, we think, another cause for this, for there seems to us to be a lack of illustrations to explain the various phenomena contained in this book. The following is a brief *résumé* of the contents of this work:—The first lecture begins with the various notions entertained as regards light by the ancients, and then proceeds with the account of the discovery by Roemer, the Danish astronomer, of its velocity, afterwards confirmed by the researches of the astronomer of our own country Bradley—the refraction and reflection of light, and the composition of solar light and its analysis by Sir Isaac Newton. We extract the account of this remarkable discovery as given by Prof. Tyndall:—

He (Newton) went to work in this way: Through the closed window-shutter of a room he pierced an orifice, and allowed a thin sunbeam to pass through it. The beam stamped a round white image of the sun on the opposite wall of the room. In the path of this beam Newton placed a prism, expecting to see the beam refracted, but also expecting to see the image of the sun, after refraction, round. To his astonishment, it was drawn out to an image with a length five times its breadth. It was, moreover, no longer white, but divided into bands of different colours. Newton saw immediately that solar light was composite, not simple. His elongated image revealed to him the fact that some constituents of the light were more deflected by the prism than others, and he concluded, therefore, that white solar light was a mixture of lights of different colours and of different degrees of refrangibility.

To the end of the first lecture the subject of solar light and its composition is gone into.

In the second lecture, the theories as regards the propagation of light are discussed—the emission theory, and undulatory or wave theory—the latter one being now generally accepted as the true one. This remarkable theory was first given to the world by Dr. Thomas Young, and for which he was most unjustly ridiculed by one who eventually became Lord Chancellor of England.

The following gives an account of this great man, and an estimate of his work :—

In the year 1773 was born, at Milverton, in Somersetshire, one of the most remarkable men that England ever produced. He was educated for the profession of a physician, but was too strong to be tied down to professional routine. He devoted himself to the study of natural philosophy, and became in all its departments a master. He was also a master of letters. Languages, ancient and modern, were housed within his brain, and, to use the words of the epithet, "he first penetrated the obscurity which had veiled for ages the hieroglyphics of Egypt." It fell to the lot of this man to discover facts in optics which Newton's theory was incompetent to explain, and his mind roamed in search of a sufficient theory. He had made himself acquainted with all the phenomena of wave-motion; with all the phenomena of sound; working successfully in this domain as an original discoverer. Thus informed and disciplined, he was prepared to detect any resemblance which might reveal itself between the phenomena of light and those of wave-motion. Such resemblances he did detect; and, spurred on by the discovery, he pursued his speculations and his experiments, until he finally succeeded in placing on an immovable basis the undulatory theory of light.

The founder of this great theory was Thomas Young, a name, perhaps, unfamiliar to many of you, but which ought to be familiar to you all. Permit me, therefore, by a kind of geometrical construction which I once ventured to employ in London, to give you a notion of the magnitude of this man. Let Newton stand erect in his age, and Young in his. Draw a straight line from Newton to Young, tangent to the heads of both. This line would slope downwards from Newton to Young, because Newton was certainly the taller man of the two. But the slope would not be steep, for the difference of stature was not excessive. The line would form what engineers call a gentle gradient from Newton to Young. Place underneath this line the biggest man born in the interval between both. It may be doubted whether he would reach the line; for if he did he would be taller intellectually than Young, and there was probably none taller. But I do not want you to rest on English estimates of Young; the German, Helmholtz, a kindred genius, thus speaks of him: "His was one of the most profound minds that the world has ever seen; but he had the misfortune to be too much in advance of his age. He excited the wonder of his contemporaries, who, however, were unable to follow him to the heights at which his daring intellect was accustomed to soar. His most important ideas lay, therefore, buried and forgotten in the folios of the Royal Society, until a new generation gradually and painfully made the same discoveries, and proved the exactness of his assertions and the truth of his demonstrations."

It is quite true, as Helmholtz says, that Young was in advance of his age; but something is to be added which illustrates the responsibility of our public writers. For twenty years this man of genius was quenched—hidden from the appreciative intellect of his countrymen—deemed in fact a dreamer, through the vigorous sarcasm of a writer who had then possession of the public ear, and who in the *Edinburgh Review* poured ridicule upon Young and his speculations. To the celebrated Frenchmen, Fresnel and Arago, he was first indebted for the restitution of his rights, for they, especially Fresnel, remade independently, as Helmholtz says, and vastly extended his discoveries. To the students of his works Young has long since appeared in his true light; but these twenty blank years pushed him from the public mind, which became in turn filled with the fame of Young's colleague at the Royal Institution, Davy, and afterwards with the fame of Faraday. Carlyle refers to a remark of Novalis, that a man's self-trust is enormously increased the moment he finds that others believe in him. If the opposite remark be true—if it be a fact that public disbelief weakens a man's force—there is no calculating the amount of damage these twenty years of neglect may have done to Young's productiveness as an investigator. It remains to be stated that his assailant was Mr. Henry Brougham, afterwards Lord Chancellor of England.

The third lecture treats of the effect of crystallization upon optical phenomena, and also of the polarization of light is gone into; and in the fourth, polarization is still more widely discussed, on, the chromatic phenomena produced by the action of crystals and double refracting bodies on polarized light is examined. Professor Tyndall, at the end of this lecture, thus sums up the changes on clouds that polarization undergoes from its first appearance on the barely visible blue to its final extinction in the coarser cloud:—

1. The actinic cloud, so long as it continues blue, discharges polarized light in all directions, but the direction of maximum polarization, like that of sky-light, is at right angles to the direction of the illuminating beam.

2. As long as the cloud remains distinctly blue the light discharged from it at right angles to the illuminating beam is perfectly polarized. It may be utterly quenched by a Nicol's prism, the cloud from which it issues being caused to disappear. Any deviation from the perpendicular enables a portion of the light to get through the prism.

3. The direction of vibration of the polarized light is at right angles to the illuminating beam. Hence a plate of tourmaline, with its axis parallel to the beam, stops the light, and with the axis parallel to the beam transmits the light.

4. A plate of selenite placed between the Nicol and the actinic cloud shows the colours of polarized light; in fact, the cloud itself plays the part of a polarizing Nicol.

5. The particles of the blue cloud are immeasurably small, but they grow gradually in size, and at a certain period of their growth cease to discharge perfectly polarized light. For some time afterwards the light that reaches the eye through the Nicol is of a magnificent blue, far exceeding in depth and purity that of the purest sky; thus the waves that first feel the influence of size at both limits of the polarization are the shortest waves of the spectrum. These are the first to accept polarization, and they are the first to escape from it.

The fifth lecture proceeds to the question of fluorescense and also the identity between light and heat. And in the sixth and final lecture, that most interesting subject, spectrum analysis, is explained, and its application to determining the different constituents,—both mineral and gaseous—of the vast universe around us; also those of our own globe.

At the end of this lecture a very complete and interesting summary of the whole of the lectures is given.

Notwithstanding such minor objections to this work as we have already detailed, we cordially recommend it to our readers, and more particularly to those studying physical science.

The Geological Evidences of the Antiquity of Man, &c., by Sir Charles Lyell, Bart., M.A., F.R.S., &c. Fourth Edition Revised. Illustrated by Woodcuts. London: John Murray, Albemarle-street. 1873.

This fourth edition of Sir Chas. Lyell's celebrated work brings the treatment of the subject-matter of its pages into accord with recent discoveries, and we know of no better way of giving a general notion of the contents of this new edition than quoting from its preface.

A space of ten years, Sir Charles observes, has now elapsed since the publication of the third edition, during which time I have been occupied with two editions of the "Principles of Geology," and two editions of the "Elements of Geology," in which I have embodied incidentally many of the daily accumulating proofs of man's antiquity. A fourth edition of this work has now long been called for, and I have therefore carefully revised it and introduced such new matter as seemed to me necessary to bring it up to the present state of our knowledge.

Finding that many persons have failed to recognise the natural connection of the three separate parts of this work, I have now placed them under three distinct titles, the first of which, called the "Antiquity of Man," might with more propriety have been distinguished as the "Geological Memorials of Man."

The second part on the Glacial Period, which was formerly the subject of much criticism, will no longer be regarded as irrelevant to the main subject of man's antiquity now that so much discussion is going on whether man is pre-glacial or post-glacial.

The third part, treating of the origin of species with reference to man's place in nature, has too evident a bearing on the preceding parts to need any special comment.

Among other corrections and improvements made in the present edition, I may mention—

1st. That in the earlier chapters I have profited in many places by the works of Sir John Lubbock on "Pre-historic Man," and that of Mr. John Evans on "Ancient Stone Implements."

2ndly. I have reconsidered the question of the rise of land in Scotland, and have brought forward the many facts which lead me to conclude that the opinion I formerly adopted, on the evidence of Mr. Geikie, that there had been a rise of twenty-five feet in Post-Roman times, is no longer tenable.

3rdly. I have added an account of the exploration of the caverns of the Lesse in Belgium by M. Dupont, and some interesting conclusions which he has drawn from them.

4thly. I have completely recast the chapter relating to Brixham Cavern and Kent's Hole, and have added some new information respecting the age of the deposits in the latter cavern.

5thly. In the spring of 1872 I visited the cave of Aurignac with my friend Mr. T. McK. Hughes, now Woodwardian Professor at Cambridge, and we convinced ourselves that the geological proofs of the remoteness of the era to which the existence of sepulchral rites may be carried back are more doubtful than M. Lartet and I had formerly supposed.

6thly. At the same time I visited with Mr. Hughes the caverns of the Dordogne of which, together with the carvings contained in them, I have given some account.

7thly. I have also given a description of a skeleton found by M. Revière in a cave at Mentone, which, from the unpolished implements and extinct animals associated with it, I am inclined to consider as of Paleolithic age. Since the sheets were printed, a second skeleton has been brought to light by M. Revière in a neighbouring cavern under similar conditions. He informs me in a letter (April 17, 1873) that he found with this second human fossil a flint lance and flint hatchet, both unpolished. Around the arms, wrists, and knees were bracelets of Mediterranean shells, Nassa, Cypræa, and Buccinum; and the skeleton and surrounding earth were stained red by oxide of iron, as was the case with the skeleton discovered in 1872. Extinct animals were found also at a higher level than this second skeleton, but I infer from letters received from Mr. Charles Moore, now at Mentone, that the time of inhumation of these remains of elephant, rhinoceros, and cave-bear in subaerial breccias at different attitudes in the cliffs will have to be critically ascertained before their geological bearing on the age of the human skeletons can be finally settled.

8thly. In Part II., in dealing with the period immediately preceding that in which we have positive traces of man, I have found it necessary entirely to recast the twelfth chapter relating to the crags of Norfolk and Suffolk, and have taken the opportunity of adding new information from the recent memoirs of Mr. Prestwich, aided by Mr. Gwyn Jeffreys, and those of MM. Searles Wood, sen., S. Wood, jun., and Harmer (Chapter XII.)

9thly. In regard to the question of ice-action in the Glacial Period, both in the British Islands and in the Alps and elsewhere, I have discussed the merits of the rival theories proposed to account for the transportation of erratic blocks and the erosion of lake-basins, and have added some new facts respecting the continental ice of Greenland derived from the observations of MM. Nordenskiöld and Richard Brown (Chapters XIII. to XV.)

10thly. In the recapitulation of the proofs of man's antiquity, I have dwelt more fully than in former editions the remote dates of civilization afforded us by the monuments and traditions of Egypt and other Oriental countries.

11thly. In Part III. I have been enabled to make one very important addition. At the time when the third edition of this work was published, the absence of intermediate links was one of the greatest difficulties experienced by the advocates of transmutation. Since then, three intermediate fossil forms have been discovered, linking together the two classes, Aves and Reptilia; and among the Mammalia, two extremely ancient and less specialised forms of the horse have been found in the Upper and Lower Miocene formations, affording evidences of the gradual modification of this animal from a different ancestral type.

12thly. In the concluding chapter on the theory of transmutation as applied to man I have considered the bearing of some of the new facts and conclusions in Mr. Darwin's "Descent of Man," and in reference to the origin of races, that of the Greeks in particular, I have considered Mr. Francis Galton's speculations on the causes of their pre-eminence as treated of in his book on "Hereditary Genius."

The following is a list of the dates of publication of successive editions of the "Antiquity of Man," and other geological works of intermediate date—

Antiquity of Man, 1st edition..	Feb. 1863
Antiquity of Man, 2nd edition..	April 1863
Antiquity of Man, 3rd edition..	Nov. 1863
Elements of Geology, 6th edition	1865
Principles of Geology, 10th edition	1866-68
Student's Elements of Geology	1871
Principles of Geology, 11th edition	1872
Antiquity of Man, 4th edition..	May 1873

We scarcely need to add that the body of the work is thoroughly consonant with these prefatory statements.

The Chemistry of Sulphuric Acid Manufacture.

By Henry Arthur Smith. London: E. and F. N. Spon, 48, Charing Cross.

This is a useful practical treatise, that may fairly be considered as a considerable addition to the aids to real technical education, being on a subject of great importance to our national industries, in many of which sulphuric acid sustains no inconsiderable part. The work commences with some historical remarks showing that it is probable that sulphuric acid was discovered in the year 806 by Rhazes, a physician in Bagdad, and not, as has been often stated, by Basil Valentine; but to quote from the work before us:—

This point, however, must be left to others more competent than myself to judge of it One thing, however, seems certain, that it was first prepared by the distillation of sulphate of iron—green vitriol. This substance, when submitted to a high temperature, yields a mixture of sulphuric and sulphurous acids, the sulphuric acid thus obtained receiving the name of "Nordhausen sulphuric acid," from the name of the place where, at the present day, this manufacture is still conducted by the distillation of the sulphate of iron.

As time wore on, however, and other manufactures became more extensive, this acid was required in much larger quantities and on a less expensive scale. It is to Dr. Roebuck, of Birmingham, that we owe the method at present employed, and which, since its introduction, has undergone comparatively little change. The changes that have been made have principally tended towards the removal of practical difficulties, whilst the principle involved in the original process remains the same.

Sulphuric acid manufacture, as carried on at the present day, may be divided into three parts:—

1. Burning sulphur or a sulphur ore in furnaces, or, as they are technically called, "kilns."
2. A large chamber in which the condensation of the acid takes place, formed of sheets of lead.
3. The necessary supply of air, of gaseous nitric acid and steam.

When sulphur is ignited in a current of air it volatilizes, and, robbing the air of part of its oxygen, becomes converted into sulphurous acid ($SO2$). This sulphurous acid, which, in its original condition, is in the form of gas, passes from the kilns by means of a flue, enters the lead chamber (No. 2 above), where, on coming in contact with the gaseous nitric acid and steam, it becomes converted into sulphuric acid at the expense of part of the oxygen of the nitric acid gas, which becomes converted into nitric oxide; this, in its turn, seizes the oxygen present in the air, and returns to its original condition.

This, as may be seen from the description, is a continuous process. And theoretically, although we find not so practically, a small amount of nitric acid is able to convert an unlimited amount of sulphurous acid into sulphuric acid, whilst the steam which is present in the chamber merely acts as a carrier of oxygen from the air to the nitric oxide.

The lead chamber, in which the condensation takes place, is built of numerous separate sheets of lead, soldered together at the edges by means of the hot flame of burning hydrogen, thus omitting the use of any substance which would be liable to be acted upon by the chamber gases, or by the acid itself. This large continuous chamber is generally about 100 feet long by 20 feet high and 30 wide. The size, however, depends entirely upon the views of the manufacturer.

This, then, is the rationale of sulphuric acid manufacture, seemingly a simple and straightforward process enough, but one which in reality requires very great care and attention.

Mr. Smith, in the following pages, details the process adopted in obtaining sulphuric acid from pyrites, as in this, as he says, is naturally included that made from pure sulphur. The presence of arsenic is the great difficulty in operating upon pyrites to obtain sulphuric acid, and a large portion of the work is, therefore, devoted to that question.

The principal member of the sulphuric acid apparatus is the leaden chamber, to which Mr. Smith devotes many pages of his work. The following extract will afford our readers a fair sample of the nature of the information conveyed in this little work:—

AN INQUIRY INTO THE BEST FORM OF LEADEN CHAMBER.

The introduction of the leaden chamber into the manufacture of sulphuric acid must be ascribed to Dr. Roebuck, of Birmingham; and the principle of the method employed by him continues as the principle of that in use at the present day.

A mixture of sulphur and nitre mixed in certain proportions was ignited and shut into an air-tight lead chamber, the side of which varied from 6 to 10 feet in diameter; after a certain time had elapsed—supposed to have been sufficient to have condensed all the acid formed by the burning sulphur—the chamber was opened, the stand and vessel in which the mixed substances were placed was withdrawn, refilled with the mixture, and again inserted into the chamber, the door of which was then luted on airtight, as before. This, then, was the rough-and-ready manner in which sulphuric acid was manufactured in this country in the days of the first lead chambers. This was the small cloud rising in the horizon which we, in our day, look back upon with a mixture of amusement and wonder. Once a beginning was made, it was easy enough to proceed, and the first step had been taken.

The obvious disadvantage in this plan was the discontinuity of the process. Each time the chamber was opened the residual gases—those which had not undergone condensation—escaped, whilst the chamber was lying idle till a fresh charge was introduced. This difficulty was overcome by the substituting for the small vessels which were being continually inserted and withdrawn, larger boilers in which the sulphur was burned, thus sending a continuous stream of sulphurous acid into the chamber; then came the introduction of steam by Kestner; and by slow degrees the great manufacture which at the present day contributes so much to the great wealth of England sprung up.

This chamber, then, is the point upon which the attention is, naturally, most concentrated. In this all the actions take place, and the nature of the work it performs, and the manner in which it performs it, are very imperfectly understood.

In the preceding pages I have shown, although imperfectly, the conditions under which this chamber does its best work; and I now intend, in a very brief manner, to inquire into the best form of chamber, which, it seems to me, is indicated by the preceding observations. By referring to pages 34-37 it will be seen that the sulphurous acid, after entering the chamber at one end, becomes almost immediately acted upon by the steam and nitric acid with which it comes in contact; that the action between the gases is very trifling towards the top of the chamber, the greatest amount of action being at the bottom. This leads me to the conclusion that the upper portion of the chamber acts merely as a reservoir for the gases, which it supplies, as they are wanted, to the lower portions, where the conditions are more favourable to the formation of acid.

If, now, instead of using the chambers as at present employed, the height were to be lessened, there would then be a much greater condensing surface than in the present form. And here I should just like to say a word respecting condensing surface. It seems to be tacitly admitted among the greater proportion of sulphuric acid manufacturers that the one thing needful for complete condensation is "condensing space;" and "condensing space" and "condensing surface" are often, indeed generally, used as synonymous terms. I have shown that very little, if any, action takes place whec there is no "surface;" the presence of some tangible substance seems to influence in some indirect way the action of the gases upon each other. This also seems to be the common-sense view to take; but even among thoroughly

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THE INVENTORS' INSTITUTE,

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SIR DAVID BREWSTER, K.H., LL.D., F.R.S., &c., from the establishment of the INVENTORS' INSTITUTE, till his decease, February, 1868.

LORD RICHARD GROSVENOR, M.P.

Chairman of the Council:

SIR ANTONIO BRADY.

NOTICES.

COUNCIL MEETING, THURSDAY, AUGUST 14TH
(7 o'clock),
At the Office of "The Scientific and Literary Review, 21, Cockspur Street.

All Subscriptions should be paid to Mr. G. A. STRETTON, the Receiver, 4, St. Martin's-place, S.W.

The Inventors' Institute.

A MEETING of members of the Institute was held on the 10th July for the purpose of conferring on the subject of the Patent Law, when Mr. F. H. VARLEY, vice-chairman of the ordinary council, took the chair.

Mr. CAMPIN (the secretary) opened the proceedings by stating that the present meeting, which was one outside the ordinary limits of the session, had been called together in order that the members might have an opportunity, before the close of the present sitting of Parliament, to say whether they would advise any action being taken on the subject of the Patent Laws, or whether, considering the present state of political matters, and the fact that the Government showed no signs of taking any Parliamentary action on that question, the Institute should abstain from moving in it. For his part he would say that he thought it would be mere waste of time to take any steps in the matter. Independently of the question of Parliamentary action, however, was one on which some further steps should be taken by the Institute. He alluded to the International Patent Law Congress at Vienna. They were doubtless aware that Dr. Collyer had been commissioned to act as their honorary commissioner at the Congress; but the Institute had not given him any specific instructions as to the line of action it wished him to take. No doubt Dr. Collyer was so well acquainted with their views and wishes that he would take the position of a faithful and efficient advocate, still the Institute might consider it proper to give him some definite instructions.

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Monthly Notices.

The past month has been noteworthy in several respects. Mr. Henry Cole, C.B., having resigned his post at South Kensington, has been the subject of testimonializing. We have so often found fault with the proceedings of this gentleman that we cannot rank ourselves as amongst those who regret his departure from office. We trust his successor will be a man who will emulate all that was good in Mr. Cole, and avoid all that was otherwise. However, Mr. Cole's services as a promoter of Public Education in Art and Science, we think no one who visits South Kensington, and knows or inquires into its history, will have the hardihood to deny. We have no wish to do so; doubtless there is something to be said for the claims of Mr. Scott Russell, Mr. Fuller, and others, as helping on the movement which culminated in South Kensington. But, what man knowing anything of Governments in general, that gigantic and apathetic animal, the Public, and our own Government in particular, can fail to see that Mr. Cole's life has been spent in doing much hard work, and that this work has produced a beneficial change in our governmental action regarding education, and has undoubtedly improved the public taste; therefore, in these days of testimonials there seems no good reason why Mr. Henry Cole should not get one worth having.

The meeting at Marlborough House of H.R.H. the Prince of Wales, the Lord Mayor and members of the City Guilds, in regard to technical education, is a matter of great importance; but these guilds will have to be cautious. Behind the Prince of Wales are the authorities of South Kensington Museum, and they are quite capable of "putting the guilds into their pockets" in this matter.

During the month two eminent men, the Bishop of Winchester (Wilberforce) and Lord Westbury (Bethell) have died.

The new Atlantic Cable has been successfully laid. It is said we are to have one of Mr. Highton's (member of the Inventors' Institute) light cables. It will cost, it is estimated, somewhere under £100,000, and, if it succeeds, the charge for telegrams to America will be considerably reduced. We must say that if a cable such as the one mentioned could be made for such a sum of money, it is well worth trying.

The Council of the Institution of Civil Engineers have awarded the following Premiums:—Watt Medals and Telford Premiums, to Sir C. A. Hartley, M. Inst. C.E., for his paper "On the Delta of the Danube, and the Provisional Works executed at the Sulina Mouth;" to J. Head, Assoc. Inst. C.E., for his paper "On the Rise and Progress of Steam Locomotion on Common Roads;" to W. Anderson, M. Inst. C.E., for his description of "The Aba-el-Wakf Sugar Factory, Upper Egypt." Telford Medals and Telford Premiums, to J. Deas, M. Inst. C.E., for his memoir "On the River Clyde;" to W. C. Thornton, C.B., for his essay "On the Relative Advantages of the 5 Feet 6 Inches Gauge, and of the Metre Gauge for the State Railways of India;" to Col. W. H. Greathed, C.B., R.E., for his "Account of the Practice and Results of Irrigation in Northern India." Telford Premiums, to J. Milroy, Assoc. Inst. C.E., for his paper "On Cylindrical or Columnar Foundations in Concrete, Brickwork, and Stonework;" and to W. Pole, LL.D., F.R.S., M. Inst. C.E, for his "Notes on the Rigi Railway."

The Académie des Sciences has elected Sir Charles Wheatstone as an associate of the Academy. The election is, however, subject to the approval of the President of the French Republic.

At the annual meeting of the South Midland Institute of Engineers, at Wolverhampton, on Monday, June 30th, Mr. Edward Jones showed samples of coal and shale that had been found in sinkings, which he was conducting for the Duke of Sutherland, at Brora, in Sutherlandshire. He added to the interest of the meeting by describing the results of his recent explorations in this Oolitic coal-field. We cannot but regret that Mr. E. Jones should have described his researches as resulting in a discovery. The Rev. Dr. Buckland and Sir C. Lyell visited Brora in 1824, and stated "that the strata there were wholly unconnected with the proper coal formation below the New Red Sandstone, and were, in fact, the equivalent of the Oolitic series." Sir R. Murchison also visited Brora in 1827, and confirmed the views of his brother geologists in a paper published in the *Geological Transactions* for that year. The fact that the sinkings now made are at some distance from the old ones does not in the least alter the geological question.

News has again arrived from America by cable of the discovery of another new small planet (No. 132), on June 13.

The Miners' Association of Cornwall and Devon has just issued its reports and proceedings for 1872-3. This association, which was founded by Mr. Robert Hunt in October, 1859, has been steadily and quietly pursuing its purpose of giving instruction in science to the miners of Western England. In its classes during the past year upwards of one hundred students have received instruction in chemistry, mineralogy, and geology, and the results, as shown in the examinations by the Department of Science and Art, are most satisfactory.

We learn from the *Chemical News* that the President of the Duchy of Hesse Nassau presented Prof. Fresenius, in the name of the Emperor, with the Gold Medal for Science. The Imperial Prince and Princess, with an autograph letter, conveyed to him a laurel wreath, while his pupils presented him several handsome gifts; the ceremonials of the day finishing with a dinner, at which more than two hundred friends and students sat down.

The sun's surface was scrutinised at the Leipzig Observatory, in the year 1872, on 198 days. On not one of those days was it destitute of spots; usually the number seen was considerable. On July 13, 65 spots were seen, divided into 10 groups; and on the four days immediately preceding this, the least number of spots was 45, and the smallest number of groups 10.

The last number of Petermann's *Mittheilungen* opens with an article by Capt. A. Niemann, "On the Russian Expedition to Khiva," illustrated by a couple of neat little maps.

The quarterly Weather Report of the Meteorological Office, Part 3, July-September, 1871, is noteworthy since, with it, we receive the Monthly Record of Observations taken at the Melbourne Observatory for February, 1873. The first is nearly two years behindhand, the second is only four months, and comes to us from our Antipodes.

A microscopic study of the crystalline rock—especially porphyrites—occurring in the valley of the Nahe, a tributary of the Rhine, has been undertaken by Prof. A. Streng, of Giessen; and the result of his studies appear in the last number of Leonhard and Geinitz's *Jahrbuch für Mineralogie*, &c.

The last number of Siebold and Kolliker's *Zeitschrift für Wissenschaftliche Zoologie* contains an interesting paper, by Dr. Carl Kraepelin, on the Structure, Mechanism, and Development of the Sting in Bees and other Hymenopterous Insects. The same number contains, among other papers of interest, one by Dr. Nitsche, on the Structure of the Head of the Tapeworm.

The *Bulletin de la Société Impériale des Naturaliste de Moscou*, No. 4, for 1872, contains an important paper, with three plates, by M. Pierre Mayewski, entitled "Evolution des Barbules du *Begonia Manicata*," and a valuable set of meteorological observations made "à l'Institut des Arpenteurs (dit Constantin) de Moscou," during 1872, communicated by M. J. Weinberg.

The *Revue Universelle des Mines et de Métallurgie* for January and February, 1873, contains a paper of upwards of one hundred pages, by M. Jules Havrez, called a "Notice sur les Progrés realisés dans les Engins d'Extraction," illustrated by a set of well-executed plates.

The Annales des Mines, the first part for 1873, gives an interesting series of researches by M. de Gouvenain, upon the chemical composition of the thermo-mineral waters of Vichy, of Bourbon-L'Archamqault, and of Neris. The most remarkable point is the notable proportion of flour discovered; the following being the quantities found in each litre:—In the waters of Vichy, nearly 8 milligr.; of Bourbon-L'Archambault, 3; and of Neris, 6. In this journal, under the head of "Législation Anglaise," the two new Acts of Parliament for the regulation of coal and metal mines have been translated into French.

M. Cazalis de Fondouce has published a quarto monograph, "On the Allés Couvertes de la Provence." He believes that these pre-historic stone monuments were constructed by a race related to the Ligurians.

Electricians will be interested in a paper by Herr F. Kohlrausch, "On the Reduction of the Siemens-Unit of Electrical Resistance to Absolute Measure." This paper appears in a recent number of Poggendorff's *Annalen*, where will be also found a long memoir by Dr. Schneebeli, entitled "Beitrage zur Kenntnis des Stabmagnetismus." The same number contains three papers by Herr H. Schroder, "On the Volumetric Constitution of Solid Bodies."—*Extract from Athenæum.*

THE INVENTORS' INSTITUTE.

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Mr. Blanchett said he would suggest that as he found, from the public journals, that written communications would be received by the Congress, that notwithstanding Dr. Collyer's appointment, the Invention Right Bill, prepared by the Institute, should be sent to it with suggestions that it was considered by the members that that Bill was a good basis for legislation.

Mr. Cressey seconded this proposition, which was put to the meeting and carried unanimously.

The Chairman then remarked that Mr. Blanchett had brought into the room a model of an apparatus for indicating to the passengers in railway carriages the name of the station they were about to arrive at, and he wished to exhibit it to the meeting, and obtain opinions on its practicability and novelty. This model was exhibited, and various suggestions were made by members present, the result being that although some modifications of details might be needed, yet it was, on the whole, an invention of practical value. The meeting then closed with a vote of thanks to the chairman.

An ordinary meeting of the Council was held previously to the above meeting, Mr. F. H. Varley, vice-chairman of the ordinary council, presiding, when it was resolved:—"That an appeal be made to the members of the Institute to pay, at an early date, all subscriptions now due in order to increase the available funds of the Institute, so that the council may be able to carry out the various important matters requiring immediate attention." Also:—"That Mr. Thomas Morgan, Secretary of the Inventors' Patent-right Association, be, and is hereby, elected a member of this council." Resolved:—"That this meeting be adjourned to Thursday, the 24th inst., at 7 o'clock p.m., to meet at the office of the Scientific Review, 21, Cockspur-street, S.W. Messrs. James Nicholas Douglas (Member of the Institution of Civil Engineers), Rev. Thomas Jones, and John Wyatt having been admitted members of the Institute, were ordered to be entered on the list of members.

On the 24th July another council meeting was held, at which the measures for giving practical effect to the resolutions passed at the meeting on the 10th inst. were duly considered, and Messrs. Henry Skoines, Jonathan Newall, Alex. McLeith, W. H. Baxter, G. F. L. Meakin, Charles Hyde, William Bates, and Thomas Black having been admitted members of the Institute, were ordered to be entered on the list of members.

A communication was laid before the Council from Mr. Ludwig Mond, forwarding tickets of admission to the International Patent Congress in Vienna. It was ordered that measures be taken for giving publicity to the fact that the Secretary had such tickets for distribution. Propositions as to the election on the council of Messrs. D. J. McLauchlan, W. Hempson Durham, and Berger Spence were passed unanimously.

Royal Polytechnic Institution, (Thursday, 26th June, 1873).—In his lecture on ice and refrigerators, Professor Gardner demonstrates the practical process of refrigerating and ice making, which have now arrived at such a pitch of excellence that ice is no longer only a luxury or a medical remedy but one of our necessary comforts. Great attention has been paid to this part of domestic art and science within our memory, and, during the past 20 years, many very clever plans have been invented for making ice. Since Leslie showed in his then novel experiments that water could be frozen by its own evaporation, a continuous series of improvements have been made. Ice is now made in large quantities by the evaporation of ether—by the evaporation of ammonia—by the expansion of air which has been previously greatly condensed and cooled before it is allowed to again expand. This plan is now brought to a great state of perfection by injecting water with the condensed air so as to absorb the heat. This the water, owing to its great capacity for heat, does most effectually. In breweries these plans are employed for "wort cooling." For domestic and household purposes we take advantage of the cold produced during the solution of various chemical substances, as in Kent's patent dinner ice maker, a clever adaptation of this principle. The process of refrigerating by ice safes is now extensively employed; a perfect safe would solve at once the difficulty of our meat supply, and the transport of foreign abundance to meet home scarcity would be easily accomplished. An ice safe is often represented by the rough and crude notion which too often presents itself in a box with two lids containing a lump of ice; against this very unscientific arrangement many objections are urged. Some improvements have been made, the most prominent is the so-called ventilation safes. This plan, to be successful, must be carried out on scientific principles, or it is a delusion and a snare, leading to waste of ice, the motive power of the machine, and to the more rapid decay of the perishable contents of the safe. An ingenious improvement, and at the same time a most simple one, is exhibited in the patent safe arranged upon a plan suggested and carried out by Mr. Kent, which brings the air to ventilate the safe in at the top and directly in contact with the ice contained in an ice box at the top of the safe; the air must by this plan pass through the body of the ice and be brought to a temperature of 32° F., or the freezing point, before it enters the safe or comes in contact with the substances contained therein. By this plan, a great result is, it seems, obtained in the length of time fish, cream, game, &c., can be preserved. It is evident that air at the freezing point would be deprived of any living organisms, because, at 32°, they would de deprived of vitality; and it is a fact well known to chemists and philosophers that water at 32° greedily seizes upon and dissolves any impure gases present in the air. These facts reasonably explain the benefits derived from this simple arrangement.

Proceedings of Societies.

ROYAL SOCIETY.

JUNE 19TH, 1873.—W. Spottiswoode, Treas. and V.P., in the chair. A number of papers were read, and the Society adjourned over the long vacation, to Thursday, November 20.

ASTRONOMICAL SOCIETY.

JUNE 13TH, 1873.—Professor Cayley, President, in the chair. Mr. J. J. Lambert was elected a Fellow. The following communications were announced, and partly read: "On the Motion of Equatorials in R.A.," by Mr. Erck,—"On the Appearance of Jupiter's Fourth Satellite in Transit," by Mr. Burton,—"Elements and Ephemeris of Temple's Comet," by Mr. Hind,—"On a possible Lunar Atmosphere," by Mr. Meison,—"Observations of Venus," by Mr. Langden,—"On the Total Solar Eclipse of June 14, 2151," by Mr. Maguire,—"On the Disappearance of the Coloured Equatorial Belt of Jupiter," by Mr. Browning,—"Co-ordinates of Stars in or near the Milky Way," and "Elements of the Five Minor Statellites of Saturn," by Mr. Marth,—"Notes on Mars," by Mr. Knobel—"Observations of Solar Eclipse of May 25," by Capt. Noble,—"Clock by Franklin," by Mr. Lecky,—"Partial Solar Eclipse, May 25," by Mr. Perry,—"Observations of Temple's Comet," by Sir G. B. Airy,—"Discovery of Minor Planet 131," by Mr. Dunkin,—"Occultations of Stars by the Moon, and Eclipses of Jupiter's Satellites," by Rev. R. Main,—"On Dr. Oudeman's Photographs of Solar Eclipse of December, 1871," by Col. Tennant,—"Determination of Longitudes by Moon Culminations," by Dr. Hall,—"On the Mass of Jupiter," by Mr. Lynn,—"On two Telescopic Meteors," and "On a Recording Micrometer," by Mr. Christie,—"On Sympathetic Influence between Clocks," by Mr. Ellis,—"On the Determination of Solar Parallax by Observations of Flora," by Mr. Galle,—and "Stereographic Projection of Transit of Venus, in 1882," by Mr. Proctor.

GEOLOGICAL SOCIETY.

JUNE 11TH, 1873.—Professor Ramsay, V.P., in the chair.—The following communications were read: "On the Nature and probable Origin of the superficial Deposits in the Valleys and Deserts of Central Persia," by Mr. W. T. Blanford,—"On *Caryophyllia Bredai*, Milne-Edwards and Haime, from the Red Crag of Woodbridge," by Professor P. M. Duncan,—"On the Cephalopoda-Bed and the Oolite Sands of Dorset and Part of Somerset," by Mr. J. Buckman,—and "On *Cetarthrosaurus Walkeri* (Seeley), an Ichthyosaurian from the Cambridge Upper Greensand," by Mr. H. G. Seeley.

June 25th.—J. Prestwich, Esq., V.P., in the chair.—T. Douglas, J. Mitchell, jun., R. Botley, D. Ruddle, J. Dunning, T. Stephens, and J. Willis, were elected Fellows. The following communications were read:—"On Six Lake-basins in Argyllshire," by the Duke of Argyll, President; "Description of the Skull of a dentigerous Bird (*Odontopteryx toliapicus*, Owen), from the London Clay of Sheppey," by Prof. R. Owen; "Contribution to the Anatomy of *Hypsilophodon Foxii*, an Account of some recently acquired Remains of this Dinosaur," by Mr. J. W. Hulke; "On the Glacial Phenomena of the 'Long Island,' or Outer Hebrides," by Mr. J. Geikie (First Paper); "Notes on the Glacial Phenomena of the Hebrides," by Mr. J. F. Campbell; "On Fossil Corals from the Eocene Formation of the West Indies," by Prof. P. Martin Duncan; and "Note on the Lignite-Deposit of Lal-Lal, Victoria, Australia," by Mr. R. Etheridge, jun. The next meeting of the society will be held on Wednesday, November 5.

ZOOLOGICAL SOCIETY.

JUNE 17TH. — The Viscount Walden, President, in the chair. — Mr. Sclater laid before the meeting the first sheets of a Catalogue of the Birds of the Neotropical Region, prepared by himself and Mr. O. Salvin, and shortly to be published under the title "Nomenclator Avium Neotropicalium." The number of species included in it, as known to the authors, was 3,565.—A letter was read from Mr. R. Swinhoe, containing intelligence of Père David's recent zoological researches in the interior of China, in the province of Shensi, south of the Ho-ang-ho.—Mr. Sclater exhibited and made remarks on a collection of birds recently made in New Guinea by Signor D'Albertis. The most remarkable of them was a new Paradise Bird, belonging to the Epimachine section, but peculiar for its long incurved bill, which was proposed to be called *Drepanephorus Albertisi*, after its discoverer.—Mr. J. W. Clark exhibited the Skull of a Seal from the Northern Pacific, which appeared to be *Halicyon Richardsi* of Gray, and explained his reasons for regarding it as indistinguishable from *Phoca vitulina* of the North Atlantic.—Papers and communications were read: from Lord Walsingham, "On the Distribution of the different Species of Deer and other Ruminants of Oregon and North California,"—by Dr. A. L. Adams, "On the Osteology of the Maltese Fossil Elephants," in which was given the description of a large collection of remains discovered by him in Malta in the years 1860-1866. Dr. Adams referred these remains to distinct species,—by Mr. H. J. Elwes, "On the Geographical Distribution of Asiatic Birds," in which he entered into the question of the best subdivision of the Indo-Malayan region,—from Dr. J. C. Cox, "On some new Species of Land and Marine Shells from Australia and the Solomon and Louisiade Islands,"—from Dr. O. Finsch, "On a new American Parrot of the Genus Chrysotis, proposed to be called *Chrysotis Bodini*,"—from Mr. W. S. Atkinson, "On a New Genus and Species of Papilionidæ, from the South-Eastern Himalayas, proposed to be called *Bhutanitis Lidderdalii*,"—by Mr. R. B. Sharpe, the fourth of a series of papers on African birds: the present memoir dealt with the African Cuckoos, which were fully described, and their geographical distribution pointed out; three new species were proposed, viz., *Cuculus aurantiirostris*, from Senegal; *Ceuthmochares Australis*, from S.E. Africa; and *Coua olivaceiceps*, from Madagascar; the paper likewise contained a revision of the sub-family Phœnicophæinæ, in which two new genera, Rhynococcyx and Poliococcyx, were characterized,—by Mr. R. B. Sharpe, describing three new species of birds, proposed to be called *Macrodipteryx Sperlingi*, from the Bay of Malimba, W. Africa; *Chamætylas Princel*, from the Gold Coast; and *Baza erythrothorax*, from Celebes,—by Mr. Sclater, "On the Curassows, based mainly upon Specimens now or lately living in the Society's Gardens," and gave details on their geographical distribution and on the variations of sex of the known species,—from Mr. R. Swinhoe, "On Chinese Deer, with Notices of the two New Species, proposed to be called *Cervus Kopschi* and *C. suopis*,"—by Mr. Sclater, "On the genus Ornithion of Hautlaub, and the Synonymy of the four known Species,"—by Mr. A. H. Garrod, "On certain Muscles of the Thigh of Birds, and their Value in Classification, founded principally upon the Examination of a large Number of Specimens that had lived in the Society's Collection."

ASIATIC SOCIETY.

JUNE 30TH.—E. Thomas, Esq., Treasurer, in the chair.—Mr. M. J. Walhouse read some notes, "On the Occurrence of European Mediæval Blades in some old Indian Weapons." On the death of the last Rajah of Tanjore the old armoury was taken possession of by the Government, and the best and most characteristic having been selected for the Madras Museum, the remainder was ultimately disposed of by auction. A number of weapons were obtained by Mr. Walhouse, some of which have the peculiarity of showing blades of European origin fitted into handles of elaborate and unmistakeably Indian devices. Some of the blades bear the initials of Christian epigraphs, such as I.N.R.I. Domine; another has the letters E.D.R.O. on the one side, and, apparently, O.U.A.N. on the other, with a cross further up the blade. A dagger contains on both sides the name of the famous sword-smith, Andrea Ferara. Some broad-swords bear, besides copious legends, mystic signs and emblems, apparently masonic or Rosicrucian, or may be smith-marks. Since Indian steel has been famous for ages, Mr. Walhouse conjectures that the mysterious letters and signs may have been held to bear some magical or talismanic virtues which caused them to be sought for. Mr. Walhouse also drew attention to a peculiar and local Hindu weapon, a kind of boomerang or throwstick, called *valaytadi* in Tamil, which is somewhat similar to the boomerang of the Australian tribes, though the Indian weapon does not possess the returning power so remarkable in the Australian ones. They are now always made from the hard wood of the mimosa tree, and used in the chase; but in the Tanjore armoury there were several of steel, which in war must have been a formidable weapon. Mr. N. B. E. Baillie then read a paper "On the *Khuráj* or Mohammedan Land-Tax, and its Effect on the Tenure of Land in India." *Khuráj* is of two kinds, *mookásumah* and *wuzeefa*; the former is a share of the actual produce, and is not due when there is none; the latter is a liability on account of a definite portion of land, and is due so long as the land is capable of bearing, whether the land be cultivated or not. To meet this liability there must be a permanent right to the productive powers of the soil, and, wherever land is subject to the *wuzeefa*, it will be found that a right of property in it has been first established in favour of some one, either by grant from conquerors or by reclamation from waste, before the *wuzeefa* was imposed upon it. Liability to *wuzeefa* is thus a test of ownership. Akbar's impost on the land was a *wuzeefa*, for which the cultivators, and none other, were made liable; and they were accordingly treated by him in his instructions to his collectors, and also by Aurungzebe, as the proprietors of the land. In the anarchy that followed soon after the death of Aurungzebe, the names of *mookásumah* and *wuzeefa* seem to have fallen out of use, but we find that the liabilities of the *wuzeefa* cultivators were transferred to the *Khoodkasht* ryots; for we are told by Mr. Shore that, at the time of the perpetual settlement of the revenue in Bengal, there was a class of ryots who were "compelled to stand to all losses, and to pay for the land whether cultivated or not." These could be none other than the *Khoodkasht* ryots, for it is still their condition, and it may be fairly inferred that, with the liabilities of the *wuzeefa* holders, they succeeded also to their rights, without which, indeed, the liabilities could not be met. Their rights, however, were ignored in favour of the official Zemindars, with whom the settlement was made as proprietors of the land. It is generally admitted that some injustice was then done to the *Khoodkasht* ryots, and a tardy attempt to remedy it, so far as that can now be done, has been recently made by an act of the Indian Legislature.

GEOGRAPHICAL SOCIETY.

MAY 26TH.—Anniversary Meeting.—Sir H. C. Rawlinson, President, in the chair. The Founder's Gold Medal, for the encouragement of geographical science and discovery, was presented to Mr. N. Elias, for the enterprise and ability he displayed in surveying the new course of the Yellow River of China, in 1868; and for his recent journey through Western Mongolia, *via* Uliassutai and Kobdo, during which he took a large series of observations for fixing positions and altitudes. The Victoria or Patron's Medal had been awarded in advance (in October last) to Mr. H. M. Stanley, for his journey to the relief of Dr. Livingstone. Gold watches, with suitable inscriptions, were awarded to Mr. T. Baines, for his long continued services to geography and his route-maps; and to Capt. Carlsen, for the circumnavigation of Spitzbergen and Nova Zemlia. The prizes to public schools for 1873 were as follows:—Physical Geography: Gold Medal, W. C. Hudson (Liverpool College); Bronze Medal, W. A. Forbes (Winchester College). Political Geography: Gold Medal, S. E. Spring Rice (Eton College); Bronze Medal, A. T. Nutt (University College School). It was announced that the special subject for the examinations in 1874, both in Physical and Political Geography, would be the British Isles. The following gentlemen were elected as Council and officers for 1873-4:—President, Sir H. Bartle Frere; Vice-Presidents, the Earl of Derby, Major-General Sir H. C. Rawlinson, Sir Rutherford Alcock, and Admiral G. H. Richards; Trustees, Lord Houghton and Sir W. C. Trevelyan, Bart.; Secretaries, C. R. Markham and R. H. Major; Foreign Secretary, J. Ball; Councillors, Admiral Sir G. Back, Hon. G. C. Brodrick, Sir F. Buxton, Bart., Admiral R. Collinson, Earl of Ducie, A. G. Findlay, J. Fergusson, Sir T. F. Fremantle, Bart., F. Galton, Major-General Sir F. J. Goldsmid, Col. J. A. Grant, J. Murray, Sir C. Nicholson, Bart., Admiral E. Ommanney, Admiral Sherard Osborn, Gen. C. P. Rigby, S. W. Silver, W. Smyth, Major-General R. Strachey, Major Sir Harry Verney, Bart,, and Capt. C. W. Wilson; Treasurer, R. T. Cocks, Esq.

SPECIAL EVENING MEETING.

July 7th.—Sir Bartle Frere, President, in the chair.—The following new members were elected:—Admiral Sir F. Grey, Messrs. C. Campbell, T. Dineen, G. Foggo, A. G. Fowler, J. O. Gordon, A. Keightley, D. A. L. M'Alpin, and W. Sowerby.—Letters were read from Lieut. Cameron, R.N., commander of the East African Expedition in aid of Livingstone, reporting the progress he had made up to the 22nd of May last. He had then reached Rehenneko, 120 miles from the coast, on Stanley's line of march, and was making halt there, in order that Lieut. Murphy, with the remainder of the stores, might come up with him. By about the 26th the united party expected to recommence their march towards Unyanyembe.—A letter was also read from Dr. Kirk, giving a description of a visit he had recently made to Somali-land, and an account of its fertility and resources.—A paper was read "On a Boat-Journey up the River Wami (opposite Zanzibar)," by Mr. C. Hill, *attaché* to Sir Bartle Frere's Zanzibar Mission. Mr. Hill ascended the river twenty-three miles, and, from his own observations and the reports of the natives, believes it is navigable, by steamers drawing two or three feet of water, for a distance of 200 miles.—The President then gave an account of his recent visit to Zanzibar, the Comoro Islands, and Madagascar, as far as related to geography and ethnology. He described the change from the monotonous, sandy coast of Somali-land to the rich, coral-fringed Zanzibar region, as very striking and sudden, after passing the mouth of the Juba. The coast navigation near Zanzibar is rendered dangerous by the abundance of coral reefs off the shore; and he hoped a strong representation would be made to Government, so that the Hydrographic Department of the Admiralty might be authorized to undertake a new and thorough survey. The chief point in Sir Bartle Frere's ethnological observations was the contrast between the three races inhabiting this part of Eastern Africa, viz., the Somali, the Gallas, and the Negroes. The Gallas he had an opportunity of studying at the Rev. Mr. Wakefield's mission-station at Ribé, near Mombasa, where he saw about thirty, who had been attracted from the interior by the missionaries, and were being educated by them. They are a well-built and handsome people, with dignified bearing, and excite great hopes of their future improvement. Sir Bartle also gave a more favourable character of the Somali than former travellers.

ANTHROPOLOGICAL INSTITUTE.

JUNE 17TH.—Professor Busk, F.R.S., President, in the chair.—Mr. J. G. Waller exhibited a series of bronze implements discovered on the site of an ancient camp near Hythe, Kent; and Mr. J. E. Price exhibited pottery and bones of bos found at New Southgate. Lieut. S. C. Holland, R.N., read a paper on "The Ainos." The following papers were also read:—"Account of an Interview with a Tribe of Bushmans in South Africa," by G. W. Stow, F.G.S. (communicated by the President); "Specimens of Native Australian Languages," by A. Mackenzie (communicated by the Earl of Kimberley); "A Brief Account of Three Microcephales," by Dr. John Shortt; "On a Patoo-Patoo from New Zealand," by Sir Duncan Gibb, Bart., M.D.; "The Healing Art in the North of Scotland in the Olden Time," by Rev. Walter Gregor, M.A.: "On a Hypogeum at Valaquie, I. of Uist," by A. Carmichael; "Heathen Ceremonies still Practised in Livonia," by the Baron de Bogouschefsky (communicated by Sir John Lubbock, Bart.); and "The Westerly Drifting of Nomads from the 15th to the 19th Century. Part XI. The Bulgarians," by H. H. Howorth.

SOCIETY OF BIBLICAL ARCHÆOLOGY.

TUESDAY, JUNE 3RD.—Dr. Birch, F.S.A., F.R.S.L., President, in the chair. The following candidates were duly elected members of the society:—John Corbet Anderson, Esq., Croydon; Alexander Mackenzie Cameron, Esq.

The following papers were then read:—

1. "The Legend of Ishtar Descending to Hades." By H. F. Talbot, D.C.L., F.R.S., &c.—In this valuable paper the author translates from the tablets the Goddess's voluntary descent into the Assyrian *Inferno*. In the cuneiform it is called the Land of No Return; and the Lord of Earth gives her a green bough of the *Li* . . . tree to protect her life (comp. Virgil's Æneid). Ishtar passes successively through the seven gates, compelled to surrender her jewels, (1) her crown, (2) her earrings, (3) her head-jewels, (4) her frontlets, (5) her girdle, (6) her finger and toe rings, (7) her necklace. The Lord of Hades seeing her sends his messenger Namatar to greet her. But as she cannot return of her own accord to the upper regions, the heavenly triad Sun, Moon, and *Hea* or Hu (Lord of Mysteries) consult, and *Hea* raises a black phantom who performs a juggler's trick before the Lord of Hades; during which he gives to Ishtar a cup full of the Waters of Life, whereby she returns to the upper world, receiving at each Hades-portal the jewels she had been deprived of in her descent. The phantom is rewarded by the most exquisite meats, wines, &c. The Greek Fate *Atropos* is supposed by the author to mean No Return, and Hades (House of Eternity) is compared with the Hebrew *Od* and *Bet-Moed* of Job xxx. 23.

2. "On the Egyptian Preposition." By M. P. Le Page Renouf, F.R.S.L.—In most languages with which we are familar, prepositions are unchangeable particles. This is not the case in Egyptian. When expressing a relation between two substantives the Egyptian preposition may be considered as a relative pronoun, as well agreeing with an antecedent, and subject to changes dependent upon the number and sometimes upon the gender of that antecedent. These transformations, and others consequent upon change of signification or of grammatical position in a sentence, are described and exemplified.

3. "On a remarkable Babylonian Brick described in the Bible." By Richard Cull, F.S.A.—The object of this paper is to show that the word translated tile in the authorised version, ought to be translated brick, in Ezekiel iv. 1, as it is the same Hebrew word as occurs in Genesis xi, 3,—"Go to, let us make brick and burn them thoroughly. And they had brick for stone and slime had they for mortar." And secondly, to show that the word translated "pourtray" in the passage Ezekiel iv. 1, ought to be engrave, when the passage will stand,—"Thou also, son of man, take thee a brick, and lay it before thee, and engrave upon it the city even Jerusalem." With this accurate translation of the two words in the description, a brick with a design, or an inscription engraved upon it, may be recognised like the bricks now found in the ruins of the ancient cities of Mesopotamia.

METEOROLOGICAL SOCIETY.

JUNE 18TH.—Dr. J. W. Tripe, President, in the chair. The following gentlemen were elected Fellows: N. St. B. Beardmore, R. H. Cooke, J. G. Marshall, and W. W. Rundell. The following papers were read:—"On some Results of Temperature Observations at Durham," by Mr. J. J. Plummer; "On the Meteorology of New Zealand, 1872," by Mr. C. R. Marten; "On the Climate of Vancouver Island," by Mr. R. H. Scott; "Meteorological Observations at Zi-Ka-Wei, near Shanghai," by the Rev. A. M. Colombel, with note by the Rev. S. J. Perry; "Notes on the Connection between Colliery Explosions and Weather," by Messrs. R. H. Scott and W. Galloway; "Distribution of Rainfall Maxima in Great Britain and Ireland, between the years 1848 and 1872 inclusive," by Mr. W. R. Birt; and "Note upon the Heavy Rainfall of March 4, at Natal," by Dr. R. J. Mann.—The Annual General Meeting was then held, when the Report of the Council was read. The Council stated that they had pleasure in congratulating the Society, at the close of the twenty-third session, upon the termination of a year which will bear favourable comparison with any that precedes it, whether regard be had to the character of the papers read, to the attendance at the periodic meetings, to the number of Fellows elected, or to the activity and interest evinced in the general proceedings. It was stated that it had been found necessary to hold an extra meeting in May, to enable all the papers which had been received to be presented before the Society; and the Council announced that it is in contemplation to hold eight monthly meetings next Session instead of six, as has hitherto been the practice. The number of Fellows added to the Society during the year amounted to thirty-five, the accession thus indicated being considerably larger than upon any year since 1864. After referring to the state of the library, the financial affairs, the proposed alterations of the bye-laws, and the Meteorological Conference at Leipzig in August last, the Council concluded by stating that they had had under consideration that evening a letter from the Board of Trade, with reference to sending a representative to the Meteorological Congress, to be held at Vienna in September next. The President then delivered an address, in which he briefly referred to the progress of the Society during the two years that he had occupied the Presidential chair. The following gentlemen were elected Officers and Council for the ensuing year:—President, Dr. R. J. Mann; Vice-Presidents, A. Brewin, G. Dines, H. S. Eaton, and Lieut.-

Col. A. Strange; Treasurer, H. Perigal; Trustees, Sir A. Brady and S. W. Silver; Secretaries, G. J. Symons and Dr. J. W. Tripe; Foreign Secretary, R. H. Scott; Council, C. Brooke, C. O. F. Cator, R. Field, F. Gaster, J. Glaisher, J. K. Laughton, W. C. Nash, T. Sopwith, Rev. F. W. Stow, Capt. H. Toynbee, C. V. Walker, and E. O. W. Whitehouse.

ARCHÆOLOGICAL INSTITUTE.

JULY 4TH.—Lord Talbot de Malahide, President, in the chair.—Sir J. Maclean reported the progress of the arrangements for the Exeter meeting, and stated that the Mayor of that city, being unable to be present that day, had desired him to assure the Institute of a hearty welcome. The Gallery of Portraits of distinguished persons promises to be an interesting feature of the Congress. The Hon. Secretary read "Notes of the Coptic Dayrs of the Wady Natrûu, and on Dayr Antonios of the Eastern Desert," by the Rev. G. J. Chester. Mr. J. H. Parker gave "Some Account of the most recent Excavations in Rome," at the conclusion of which he urged the importance of continuing the work, which was now at a stand for lack of funds. The Rev. F. Spurrell read "Notice of the Stone Coffin of Ingelrica, Foundress of Hatfield Peverell Priory, Essex," which had been found in the course of recent works of restoration, and which was of the early part of the twelfth century. The Hon. Secretary read a communication from Mr. Roach Smith, describing an "oppidum" on Hayling Island, Hants, called Tournabury. Mr. O. Morgan, M.P., exhibited a pedometer of the sixteenth century; a pedometer and counting machine, with calendar showing the year, month, days of month and week, the rising and setting of the sun, by N. Hager, of Arnstad, in Thuringia, date 1690; also, a nocturnal dial, with calendar of months and days, vane to show the quarter from which the wind blows, compass and telescope, by the same maker; also, a pedometer, compass and sun-dial, by Johan Melchior Landeck, of Nuremberg, seventeenth century. Mr. Henderson sent a Persian vase, probably not very ancient, of rich perforated work, and of a kind used for decorative purposes; also, a dagger of Stamboul make, with name of owner and passages from the Koran in early Arabic characters. The handle is richly carved, and probably of Agra work; also, an Indian dagger, in richly enamelled sheath, with carved jade handle, presented by Hyder Ali to Sir Hector Monro, and acquired from his son by Mr. Davidson. The Earl of Harrington sent a small "Madonna and Child," by Raffaelle, which had been presented to William, Earl of Harrington, by Phillip the Fifth of Spain, in 1729. Mr. J. James sent a collection of mediæval spurs, containing some remarkable specimens. Mr. Nightingale exhibited a damask table-cloth, in which were woven figures of St. George and the Dragon, shield with the arms of Queen Elizabeth impaling those of her mother, Anne Boleyn, the badge of Anne Boleyn, portrait of Queen Elizabeth, and the words "Qvene Elisabeth" and "God Save the Qvene," with a border of point lace, and marked E. R. Mr. Clark exhibited the Original Charter of the borough of Llantrissaint, 3 Henry 6. Mrs. Bever sent an early deed relating to Stratfield Mortimer, Hants, and Mr. Golding exhibited a commonplace-book of the sixteenth century, and sketches of a rood screen at Eye, Suffolk.

ENTOMOLOGICAL SOCIETY.

JULY 7TH.—H. T. Stainton, Esq., V.P., in the chair.—Mr. Weir exhibited specimens of *Agrotera nemoralis*, taken at Abbott's Wood, near Lewes. Mr. M'Lachlan exhibited a remarkable instance of hermaphroditism in a specimen of a fly (one of the Syrphidæ), taken at Black Park. Mr. T. Blackmore exhibited specimens of a gall, found on oaks, near Tangier, which were taken possession of for a habitation by a species of ant (*Cremotogaster scutellaris*, Oliv.). Mr. W. Pryer exhibited some fine specimens of Lepidoptera, from China. Sir S. Saunders communicated a paper, "On the Habits of Economy of certain Hymenopterous Insects which nidificate in Briars, and their Parasites." The insects were exhibited at the last meeting; and Sir S. Saunders further exhibited a specimen of a Raphiglossa, which he had suffocated with cyanide of potassium whilst asleep, showing the remarkable position of the insect during repose, as described in the paper. Mr. Butler communicated a list of the species of Galeodides, with description of a new species in the British Museum.

CHEMICAL SOCIETY.

JUNE 19TH.—Dr. Odling, President, in the chair.—The following communications were read:—"Researches on the Action of the Copper-Zinc Couple on Organic Bodies," III.; "On Normal and Iso-propyl Iodides," by Messrs. J. H. Gladstone and A. Tribe, being a continuation, in the propyl series, of the authors' previous researches; "On the Influence of Pressure on Fermentation," Part II.; "The Influence of Reduced Atmospheric Pressure on the Alcoholic Fermentation," by Mr. H. T. Brown, in which he finds that, under diminished pressure, the progress of the alcoholic fermentation is retarded in a remarkable way; "On Cymene from Different Sources optically considered," by Mr. J. H. Gladstone; "Note on the Action of Bromine on Alizarine," by Mr. W. H. Perkin: this reaction gives rise to *bromalizarine*, an orange-coloured crystalline substance, possessing feebler dyeing properties than pure alizarine, the colouring principle of madder; "On some Oxidation and Decomposition Products of Morphine Derivatives," by Messrs. E. L. Mayer and C. R. A. Wright; "On the Decomposition of Tricalcic Phosphate by Water," by Mr. R. Warrington; Communications from the Laboratory of the London Institution, No. XII., "On the Nature and on some Derivatives of Coal-Tar Cresol," by Dr. H. E. Armstrong and Mr. C. L. Field; "On a New Tellurium Mineral, with Notes on a Systematic Minerological Nomenclature," by Mr. J. B. Hannay; and "Note on the Relation among the Atomic Weights," by Mr. J. A. R. Newlands. The President congratulated the members on the flourishing state of the society, and on the number and importance of the papers that had been read during the session.

REVIEWS.

(Continued from Page 128.)

practical men the confusion regarding "space" and "surface" seems to be very great.

To return, however, to my subject. Suppose the height of the chamber were diminished, the condensing surface is increased, and there is nothing admitted into the chamber which would tend to baffle the draught in any way—indeed, according to the shape of the proposed chamber, the draught will be rather increased; we also bring the gases more in contact with any already-formed acid at the bottom of the chamber, which I have shown determines very rapidly the action between the gases. This form of chamber also would be much more easily managed than the one now in use, which, from its very unwieldiness, involves the manufacturer in many expenses which are, in reality, perfectly needless. If, again, the mere item of expense be considered, I think every one will agree that the expense of building a chamber half the size of that in use at present would be a very considerable advantage to the manufacturer. The dimensions of the chamber I would recommend are as follows:—

Length, 160, 200, or even 210 feet.
Width, 30 feet, increasing in ratio to length.
Height, 10 feet, and for any length of chamber the height should not be increased.

I feel confident from my own experience, encouraged greatly by my experiments, that the foregoing size of chamber would be much preferable to our present large-sized ones, and would not only give a much larger yield of vitriol from the same expenditure of sulphur, but would, in the mere matter even of chamber room, be of great value to the manufacturer.

Before leaving this part of my subject, I would like to notice two methods of working sulphuric acid chambers which seem to me to deserve special attention—those of Mr. Ward and Mr. Gossage.

The method proposed by Mr. Ward consists in adding more condensing surface to the chamber, by the introduction of glass sheets or tubes, placed horizontally and longitudinally in the chamber upon which the acid condenses.

Mr. Smith gives a detailed description of this apparatus from Richardson and Watts' Technology, also of Mr. Gossage's patent, A.D. 1857, and then proceeds:—

A great cry used to be for a large chamber—one with plenty of room in it—this was the idea of one of our greatest manufacturers; whereas the idea embodied in Mr. Ward's patent is much nearer the truth, although it is not quite it; at least, it seems to me we have in it a perplexity of means to attain a simple end. Mr. Ward has first a small mixing chamber into which the gages pass before entering the large chamber, when the greatest amount of condensation takes place. Again, the presence of the glass tubes in such large quantity may serve, as Mr. Ward himself says, to baffle the draught. What goes on in Mr. Ward's two chambers is exactly similar to that occuring in the one chamber in general use in sulphuric acid manufacture, with the difference that Mr. Ward gives additional condensing surface. But the chamber in which the glass tubes are placed (which after this I will call the second chamber) must be proportional in size to the amount of sulphur admitted to the chamber, so that if he had fewer kilns he would require to curtail the length of the second chamber and most probably the capacity of the first—that is to say, he would simply have less condensing surface. (I say the length of the second chamber, as I do not for a moment imagine he would further baffle the draught by diminishing the height or width.) Here, then, it appears to me we have rather a useless expenditure of appliance. If Mr. Ward did away with the interior padding of his second chamber, and raised its height, say, to 8 or 10 feet, with a corresponding difference in width, still, however, keeping the same length, he would have, for an average amount of acid, obtained a less expensive chamber, and one which would be quite as efficient for the required purpose. I have shown in a preceding page that in the ordinary chamber the greatest amount of action between the gases takes place at the bottom of the chamber, whilst little or no action takes place above; if then the chamber be extended in length, and diminished in height and width, the required purpose is answered. Let the draught be only moderately fast, and from one chamber pass the gases into another similarly constructed (as is done now with the present form), and we have a very inexpensive chamber; in fact, we have the greatest amount of work done with least outlay. This is evidently the principle of Mr. Gossage's chamber, only he recommends a vertical instead of a horizontal passage of the gases. There is one great drawback, however, in this process; he does not allow the gases to be exposed to the surface on which they condense most readily—I mean the surface of already-formed sulphuric acid. I have already shown that the action between the gases takes place much more rapidly when sulphuric acid is already present in the vessel; and this is a fact well known to some manufacturers; but if Mr. Gossage's chambers were to be laid horizontally instead of vertically, there would be a great exposure to this surface, and therefore a greater yield of acid, and would also be the form of chamber which Mr. Ward recommends, minus the padding, and the one which I have already said seems to be distinctly pointed out by chemical analysis and careful investigation of the various conditions under which the miximum amount of sulphuric acid is formed.

The Little Dressmaker. Fashions for children and dolls. Edited by Mme. Schild. Containing a beautiful illustration of the latest fashions for children's and dolls' clothing, with the cut paper patterns, &c. July No. London: S. Miller, 37, Tavistock Street, Covent Garden, W.C.

This work continues to sustain its useful and pleasant character, the number before us being equal to any that has preceded it.

"The Gateway to the Polynia."

"A Voyage to Spitzbergen." From the journal of John C. Wells, R.N. With numerous illustratious. Henry S. King and Co., 65, Cornhill, and 12, Paternoster-row. 1873.

"The Story of a Life and Two Sequels." By Wm. Alfred Gibbs. The Critics' Edition. London: Provost and Co., Covent Garden. 1873.

We are not able to do more at present than acknowledge the receipt of these works.

SANDERSON AND PROCTOR'S IMPROVEMENTS IN BOILERS AND FURNACES.

These boiler's generators are constructed in globular form, with hot air tubes passing through the same, and also, if required, a ring, or endless tube, is added, providing a steam, or water space, communicating with the steam and water space of the globular part, such ring, or endless tube, being available as a superheater, or as an additional steam space. The furnace arrangements consist of five bars concentrically arranged so as to converge to central upright shafting, which should be tubular to allow the same to be prolonged and connected with the bottom of the boiler, so as to be utilizable for the blow off, and the entrance for feed water to the boiler. One end of each such fire bars can thus be supported in such shafting, and the bars be revolved by means of a turn-table, and by a pendant to each bar, which pendant comes in contact with a stationary bar, or by gearing, the fire bars can be continually tilted, so as to remove clinkers, and reduce the amount of stoking required.

The bars are to be inclined towards the central shafting, so as to cause the fire to correspond with the form of the boiler. The furnace can be fed by a hopper or otherwise.

Instead of having, as above described, hot air tubes passing through the water space of the boiler, we can, if desired, reverse this arrangement, and have water tubes, and fire or heat space surrounding them. Messrs. Sanderson and Proctor, of Huddersfield, are the inventors and patentees of this important invention.

WEST'S DRESS STUDS.

The object of this invention is to produce studs, or solitaires, or other similar fasteners for garments of two separate parts, which are capable of being attached, or detached, by the use of the arrangement such as hereafter described, and such a stud, from its greater facility of manipulation, its superior neatness of appearance, and greater comfort to the wearer, will be found more advantageous than one in any plan hitherto adopted.

The above object is effectuated by making one part of the stud as a hollow plate, or as may generally be preferable by forming a small box, or case thereon, in which is fitted a spring catch or equivalent for the purpose hereafter described. In the centre of one part of the stud is the shank or solid pin similar to that ordinarily used. Through the end of the hollow plate, box, or case project the ends of the catch or equivalent, which ends might, however, if desirable, be brought together to form only one end. The other part of the stud has a hollow pin or shank, which is to be fitted on to the solid pin herein before mentioned; and when fitted in the spring catch secures it in its place, and holds the two parts of the stud or fastener firmly together. By pressing the end of the spring catch the pin of stud will be released, and the two parts can be separated and removed from the person if demanded.

The inventor and patentee of this ingenious and useful article is William West, of Hockley, Birmingham.

GLEN'S IMPROVEMENTS IN TRAMWAY CARS.

Recently at the Royal Scottish Society of Arts, Mr. T. Ivory, president, in the chair, Mr. Geo. Glen, upholsterer, read a paper on "Improved Tramway Cars." The cars as at present constructed, he said, must, in taking the curves, not only affect the draught of the horses, but also increase the tear and wear of wheels and rails, and cause frequent lifting and relaying. A look at the cars will show that the wheels did not adapt themselves to the curves; their running off the rails or on to wrong lines proved this. He produced a model of his invention, the wheels of which, he pointed out, adapted and adjusted themselves to every curve that might come in their way, and reduced the friction to the smallest possible degree. The principle of his model admitted of the wheels farther apart, thus giving a greater bearing to the whole car and removing a considerable strain from the frame-work. On the principle of his model the driver was enabled, by means of a lever in front, to take the points with the greatest certainty, and with considerable relief to the horses compared with the present system. The usual brakes could be applied in his invention, and a very simple cleaner could be attached, which might be used or not as required. The three leading points of his invention were—the double axle, the action of the bogie to secure straight radial lines, and a diagonal rod for the purpose of controlling the back wheels and taking points. After the reading of Mr. Glen's paper, several members made observations upon it, chiefly with the view of having the invention explained in its details.—*Scotsman*, May 13th, 1873.

APPLICATIONS FOR PATENTS.

Continued from Page 122.

Locomotives (com.)—J. R. Bennett. Mode of working the slide valves of steam engines.—J. Hinks and H. Holland. Manufacture of gas for heating and illuminating, and the utilization of residual products of the said manufacture.—J. Whichcord and W. Anderson. Manufacture of slabs and panels applicable to strong rooms and safes.—W. R. Lake. Engraving and chasing machines (com.)

On June 10th.—2050 to 2062.—W. F. Hayward. Iron safes, and locks or fastenings for the same, part of which improvements are applicable for other purposes. — W. Lockwood. Means employed for converting iron into steel.—T. Stafford. Machinery or apparatus used in making laps of cotton and other fibrous substances.—J. H. Sandy. Galvanic batteries, and the fittings, mountings, and apparatus connected therewith.—G. Garrett. Machinery for finishing metal tubes.—J. Marley and R. Thompson. Construction and arrangement of the flues of coke ovens, especially with reference to the consumption of smoke fumes and gases.—E. Hinchliffe. Manufacture of woollen and other fabrics.—T. Stebins, A. Rosenfield, H. Mayers, and W. F. Leon. Hydraulic hoisting apparatus, including an improved friction clutch, an improved safety device for elevator cages and an improved governor or brake for regulating the descent of the cage. (Complete specification.)—J. H. Johnson. Umbrella frames, and the process of and machinery for manufacturing the same (com.)—J. H. Johnson. Moving and raising coal and other granular material, and the machinery or apparatus employed therein (com.)—J. H. Johnson. Rolling mills (com.)—J. H. Johnson. Casting chilled rolls (com.) (Complete specification.)—J. Taylor, M.D. Apparatus to be applied to the sights of firearms.

On June 11th.—2063 to 2077.—S. Kingan. Refrigerating apparatus (com.)—G. Haseltine. Furnaces for producing wrought iron directly from the ore (com.) (Complete specification.)—J. Nettlefold. Secretly and accurately recording by machinery the votes given at the election of members to serve in Parliament, and at other elections when secret voting is required, called the "Balloting engine."—C. Farrow. Construction of iron wine bin.—W. Neil. Refiner for distilling apparatus. (Complete specification.)—D. Williamson. Thinning turnips and other crops, and the machinery or apparatus employed therefor.—W. Phillips. Apparatus for marking or scoring and registering billiards and other games, and for other similar purposes.—H. Wincen. Gas meters.—J. Leigh. Mode of treating sewage and other contaminated waters.—C. D. Abel. Apparatus for decorticating hop bines so as to obtain therefrom fibre for the manufacture of paper pulp, cordage, woven fabrics, and for other purposes to which vegetable fibre is applicable (com.)—G. A. Bridgett. Steam engine expansion gear and governors.—J. G. Smith. Automaton balances for weighing coins and coin blanks (com.)—J. Guenard. Machinery for drying coffee and grain.—L. Bopp-Du-Pont. Self-acting cooking apparatus.—W. Rowett. Manufacture of electric telegraph cables or ropes.

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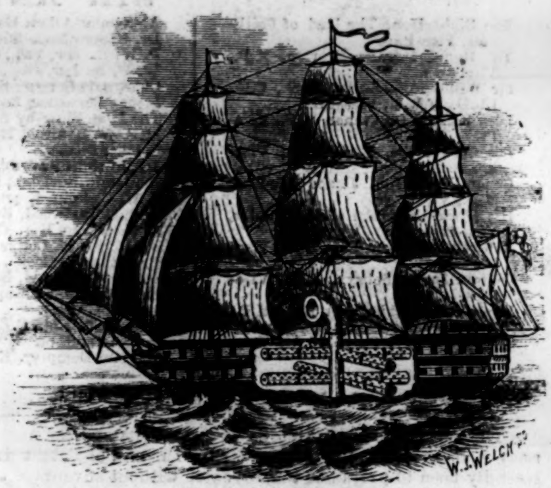

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